Vol. III

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1942

No. 721

THE NORTH AMERICAN COMPANY, PETITIONER,

vs.

SECURITIES AND EXCHANGE COMMISSION

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

PETITION FOR CERTIORARI FILED FEBRUARY 10, 1943.

CERTIORARI GRANTED MARCH 1, 1943.

United States Circuit Court of Appeals
FOR THE SECOND CIRCUIT

October Term, No. ——

THE NORTH AMERICAN COMPANY,
Petitioner,

v.

SECURITIES AND EXCHANGE COMMISSION,
Respondent.

TRANSCRIPT OF RECORD
TESTIMONY
Volume III
(Pages 669 to 1102)

ON PETITIONS FOR REVIEW OF ORDERS OF SECURITIES AND EXCHANGE COMMISSION

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Volume III.

BEFORE THE 2005

Securities and Exchange Commission

File No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.* 2006

Hearing Room 1101,
Securities and Exchange Commission Building,
Thursday, August 15, 1940,
Washington, D. C.

--- 2007

Met, pursuant to recess, at 10 o'clock a. m.

Before: W. W. SWIFT, *Trial Examiner.*

Appearances:

(As heretofore noted.)

PROCEEDINGS

The Examiner: Are you ready to proceed?

Mr. Browning: Yes.

The Examiner: The hearing will come to order.

Mr. Hamilton: Mr. Schaber.

Whereupon, Charles F. Schaber called as a witness on behalf of the Respondents, being first duly sworn, was examined and testified as follows:

2009

Direct Examination by Mr. Hamilton:

Q. Would you give your name, please? A. Charles F. Schaber.

Q. Your address? A. Bucyrus, Ohio.

Q. Were you formerly a member of the Public Utilities Commission of Ohio? A. I was.

Q. For what period? A. I became a member of the Ohio Commission in January 1933, and served until the first of February 1939.

2010 Q. And, during that period, did you serve as Chairman of the Commission? A. I served as Chairman of the Commission the last two years of that period.

—1,020—

Q. Prior and subsequent to the period of your service as a member of the Commission, were you engaged in the practice of law? A. I have been engaged in the practice of law in Ohio since 1901. I practiced before I went on the Commission, and then engaged in general practice since I retired from the Commission.

 2011

Q. In what year did regulation of electric utilities by the Public Utilities Commission of Ohio begin? A. The first enactment, creating commissions for regulation of utilities generally, including electric utilities, was in 1911. At that time the Ohio Public Service Commission was created and a year or two after that the name was changed to the Ohio Public Utilities Commission—or, rather, the Public Utilities Commission of Ohio.

Q. Will you describe the extent of the Commission's staff? A. Well, in recent years, during my term of service, 2012
we had approximately 90 official employees. They consist of clerical force, engineers, accountants, investigators, and inspectors.

Q. In what respects does the Public Utilities Commission of Ohio regulate electric utilities in the state? A. Well, that is a broad question. The statutes of Ohio confer the power upon the——

—1,021—

Mr. Binford: Mr. Examiner, I object to any statement by the witness as to what the statutes of Ohio provide, in view of the fact that such statutes them- 2013
selves are the best evidence of what they provide.

A stipulation was entered into at the beginning of this case, that the laws of the several states, as they may enter into consideration of this case, relating to public utilities and regulation thereof, might be officially noticed by the Commission, which stipulation, I believe, was suggested by counsel for Respondents and assented to by me.

In view of that fact, I insist on the objection to any statement as to what the laws provide, on the

2014

ground that that is not the best evidence, and the best evidence is already by stipulation officially before this Commission.

Mr. Hamilton: Mr. Examiner, my question didn't relate specifically to what the statutes may or may not provide.

Mr. Binford: My objection is not to the question; my objection is to the statement of the witness.

2015 *By Mr. Hamilton*:

Q. I would like to have the witness describe, if he will, what, in fact, the Public Utilities Commission of Ohio does in respect to regulation? A. Well, the Ohio Commission has prescribed the classification of accounts and utilities are required to, and do, conform to that accounting procedure and practice.

—1,022—

The Commission considers, of course, the matter of adequacy of service being rendered by the utility, keeps in touch with the operations of the utilities to ascertain whether the
2016 service is adequate.

Rates are fixed and determined by the Ohio Commission in certain instances. Other rates are fixed and determined by counsel of the various municipalities of the State.

The Commission also authorizes security issues and investigates complaints, corrects abuses if any have been ascertained or discovered.

The Commission also inquires as to matters of discontinued service, extension of service, and generally supervises the operations within the jurisdiction of the Commission.

 2017

The acquisition of property is a matter that is also acted upon by the Commission. Contracts between utilities are acted upon, must have the Commission's approval. And many other functions that I just can't recall at this particular time.

The Commission keeps in close contact and touch with the operations of the various utilities that operate in the State of Ohio.

Q. Does the Commission regulate the issuance of securities by public utilities? A. It does. 2018

Q. Can you state whether, from your experience on the

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Commission, you know whether The Cleveland Electric Illuminating Company has filed with the Commission statements of property additions and retirements? A. That is correct. That Company does file, I believe, semi-annually, a report as to additions to plant and retirement from plant.

It is the only utility that I have any recollection of that does that particular thing, as far as filing of those semi-annual reports with the Commission.

That is not an absolute requirement on the part of the 2019
Commission. They do that voluntarily.

Q. From your experience, will you state whether the size of the electric utility being regulated by the Public Utilities Commission of Ohio in any way affects the effectiveness of the regulation by that Commission? A. I would say not.

Q. In other words, a large utility is not more difficult to regulate than a small utility? A. I would say it is not. Size I do not consider has anything whatever to do with the effectiveness of the regulation.

Q. Are you aware of the fact that voting stock control of The Cleveland Electric Illuminating Company is held by The North American Company? A. That has been my understanding.

—1,024—

Q. In your opinion, has the fact of such voting stock control restricted or obstructed regulation of The Cleveland Electric Illuminating Company by the Public Utilities Commission of Ohio? A. It has not in any way affected the
2021 regulation of the operating company.

Q. What effect does the existence of such control have on such regulation? A. That doesn't enter at all into the matter of regulation on the part of the Ohio Commission.

Mr. Hamilton: That is all.

Cross Examination by Mr. Binford:

Q. How many members are there on the Ohio Commission? A. There are three members appointed by the Government.

2022 Q. You served from 1933 through 1939? A. Yes. 6 years.

Mr. Binford: No further questions. Same reservation as made in respect to other witnesses.

Mr. Hamilton: And again the same comment on our part, Mr. Examiner.

Mr. Browning: Could we have an understanding that we always object to Mr. Binford's reservation, so that we wouldn't have to state it each time.

The Examiner: Yes. I think that is proper to be added on the record at this time.

—1,025—

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Mr. Binford: We will try to make it shorter each time.

Mr. Browning: Mr. Crawford.

Whereupon, Eben G. Crawford called as a witness on behalf of the Respondents, being first duly sworn, was examined and testified as follows:

Direct Examination by Mr. Browning: 2024

Q. Will you give your name and address to the Reporter, Mr. Crawford? A. My name is Eben G. Crawford, 2864 Eaton Road, Shaker Heights, Ohio.

Q. Mr. Crawford, you are president of The Cleveland Electric Illuminating Company? A. I am.

Q. Will you describe briefly your education and business experience? A. I was born in Franklin, Pennsylvania, a small town in what we call the oil country in western Pennsylvania, in 1883.

My father was a small-town banker. I lived in Franklin, going to the Franklin schools and graduating from the 2025
Franklin High School in 1900.

I entered Dartmouth College in the fall of 1900 and was

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there one year. I returned to Franklin, got a job in a bank as messenger.

I worked in that bank until 1910, at which time—of course, I say it was a very small bank, a small organization, —and I retired in 1910 from the bank as assistant cashier. I bought a jewelry store in Franklin and ran, or misran, that jewelry store for three years, and sold out.

I was married by that time and had a small family. My next job was with the Venango Manufacturing Company, which was a small local concern, with a foundry and machine shop, making patented appliances for use on railroad locomotives. I went in there as a machinist assistant and did all sorts of jobs around the plant.

I was there for three years. The last year——

Q. (Interposing) Beginning in 1913? A. Beginning in 1913; that is right.

2027 The last year I was engaged in selling castings—gray iron castings. They had a foundry that was larger than their own needs and I conceived the idea that we might sell some castings, so for a year I traveled around western Pennsylvania selling castings for this concern.

In November, 1916, I went to Cleveland, where I was employed by an investment banking house as a bond salesman. I did fairly well at that, until the war broke out, when I entered the Liberty Loan Organization in Cleveland. That was a government organization for the selling of liberty

—1,027—

2028 bonds. I was assigned five counties in northeastern Ohio, over which I had supervision in the matter of selling these bonds.

At the close of the war, and when I stopped selling liberty bonds, I remained with the Federal Reserve Bank of Cleveland for a year or a year and a half, selling United States treasury certificates to banks in those five counties.

Q. Those five counties are the same counties which comprise the present territory of the Illuminating Company? A. They were Cuyahoga, Lake, Geauga and Ashtubula, which

are in the territory of the Illuminating Company, and Mahoning County in which Youngstown is located.

Then I also, during that period, was working on the matter of inducing non-member banks, of which there were a good many in those days, to join the Federal Reserve System, and I was able to get a number of them to do that.

In the fall of 1920 there was a merger of three of the large Cleveland banks into a new bank called the Union Trust Company, and they started with a very large bond department. The vice president in charge of that bond de- 2030
partment employed me to go to work for them and wholesale bonds among other dealers. They were engaged in originating a lot of issues. I went to work there about the first of January in 1921, and in April of 1921 I was elected secretary of The Cleveland Electric Illuminating Company.

—1,028—

I went to work there about the 15th of April and I have been there in one capacity or another ever since.

Q. Tell us what your capacities with the Illuminating Company have been. A. Well, I was elected secretary of the Company, as I say, in April 1921, and I continued as secre- 2031
tary for the Company until—that was my official title—until February of 1933, when I was made vice president and secretary.

On the death of Mr. Lindsay, the president of the Company, late in August of 1933, I was made president of the Company.

Mr. Lindsay had been critically ill for two years before his death. The last year of his life he spent down at Charlottesville, Virginia. He had built a house down there and wanted to be there because he could get treatment, for the

illness that killed him, from specialists in the University of Virginia.

He had been practically incapacitated for two years before that, and it devolved upon me to rather take over the running of the Company, particularly the contacts with The North American Company in New York, so that it was pretty well decided, before Mr. Lindsay's death, at the time I was made vice president in the spring of 1933, I think, it was pretty well understood that upon Mr. Lindsay's death I
2033 would remain president of the Company, and I was so elected in September of that year.

—1,029—

Q. You have resided in Cleveland for the period from November, 1916, to date, then? A. That is right.

Q. Mr. Crawford, are you a director of any corporations or organizations other than the Illuminating Company? A. Yes, I am a director of the National City Bank of Cleveland, and have been since 1933.

I am a director of the Wheeling & Lake Erie Railroad, and have been since 1933, I think.

2034 I am on the Board of Trustees of Cleveland College and I am on the Board of Trustees of the Cleveland Regional Association, which is a civic association, planning the future development of Cleveland, as to highways and zoning and improvement of the metropolitan area.

I was for a number of years chairman of the Depositors Committee of the Union Trust Company, which Union Trust Company was closed at the time of the banking crisis in 1933. I was chairman of the Depositors Committee until a new bank was organized in 1938—the Union Bank of Commerce—to take over the unliquidated assets of the bank and

pay out and liquidate the assets and make further payments to depositors.

That committee was dissolved upon the completion of the formation of the new bank.

I was also president, in 1936, of the Great Lakes Ex-

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position, which was patterned after the Century of Progress in Chicago, operated for two years in Cleveland, and brought a lot of people into the town and was an aesthetic success if not a financial one. 2036

(Discussion off the record.)

Q. Will you please describe the organization of the operating staff of the Illuminating Company? A. The operating staff is responsible to the Board of Directors through the president, through the vice president and general manager, who is in charge of the general operations of the Company, the vice president and treasurer, the vice president in charge of sales, and the secretary and the comptroller.

The president also has three assistants, and we have Mr. Frank M. Cobb, who has been our general counsel for many 2037
years, with offices right in our building, who devotes all his time and practice to the affairs of the Company.

In general charge of operations is Mr. H. W. Hough. Mr. Hough has been with the Company——

Mr. Browning: Just a minute. Off the record.

(Discussion off the record.)

A. (Continuing) Mr. Hough has been with the Company for thirty years, has lived in Cleveland all that time, starting with the Company as an engineer, became research engineer.

—1,031—

Then he became assistant to the president, when Mr. Lindsay was in charge of the Company, and, upon my election as president of the Company, he was elected vice president and general manager, and put in charge of the general operations of the Company.

The vice president and treasurer, Mr. Charles W. Mills—Mr. Mills is a man 71 years old, who has lived in Cleveland all his life. He has been with the Company since 1893, 47 years.

2039 He started in as a bookkeeper. In 1893 the Company was, of course, just a baby, and he has been treasurer of The Cleveland Electric Illuminating Company since 1921. He was born in Cleveland. He lives in East Cleveland, East Cleveland being, as you know, contiguous to Cleveland. The only way you can tell the difference is the fact that there is a municipal border line across there.

He is in charge of the treasury department. He has 86 employees in the various branches of that department. He is responsible for the receipts and checks and money and bills and bank accounts, and similar property.

2040 He has an assistant treasurer and has a collection department under his jurisdiction.

And we have an assistant secretary and an assistant treasurer—Mr. C. L. Mills—who is no relative of the other Mr. Mills.

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Mr. C. L. Mills is a man 59 years old. He has been with the Company 40 years or 41. He has charge of the minute books of the subsidiary companies, Employees Fund—I don't know whether it has been described by the other witness or not—and also the records of the pension fund, and he signs

as assistant secretary or assistant treasurer, when such signature is required.

Mr. C. W. Mills, vice president and treasurer, also has under his jurisdiction the collection department. It is a very important department of the Company.

The head of the collection department is Mr. Harry D. Ballard, who has been with the Company 26 years and is a born Clevelander.

His department supervises credit arrangements, collec-
tion of delinquent or past-due accounts. They make adjust- 2042
ments of complaints or errors in billing; they make settlements of any customer complaints involving money, and they maintain the contacts and relations with the many paying agents which the company has.

Our customers can pay bills at any one of the branches of the Cleveland Trust Company, which has about 52 or 53 branches; of the Central National Bank, which has about fifteen neighborhood branches, and then, where those branch banks are not conveniently located, we have set up agencies in stores in some little shopping sections, so it is no hard-
ship, it isn't difficult for a customer to go and pay his bill, 2043

—1,033—

and the collection department maintains those contacts and sees that the arrangements are properly carried out.

The vice president in charge of sales is Mr. H. C. Gillie.

Q. Is that H. C.? A. H. C. Harry C.

He has been with the company 33 years. He came to Cleveland from the West in 1898 and has lived in and around Cleveland ever since. He went through Case School, graduated as a mechanical engineer, came into our power sales department shortly after.

He was a power salesman; then he was promoted to be in charge of all the power salesmen and in 1933, when I took over the presidency, he was made sales manager.

His predecessor, who had grown old in the business, was retired. In 1935, at my suggestion, the Board of Directors elected him vice president in charge of sales.

It didn't change his duties or his responsibilities any but we felt that it would give him a better standing among the large power buyers, and so, since then, he has been vice presi-
2045 dent in charge of sales.

He has about 150 employees in industrial, commercial, and residential sales.

Under him, in charge of domestic sales—that is, sales

—1,034—

to residential consumers, is Mr. J. E. North, who has been with the Company 21 years, has been in Cleveland all that time and has been president of the Electrical League all during that period.

Mr. North has a staff of 83 workers in residential sales promotion, and some of those men also work in cooperation
2046 with the dealers in the distribution of appliances.

Mr. North is an employee of the Company in charge of domestic sales, and he also directs the Electrical League. I think our Cleveland Electrical League was the first institution of that kind, and has been used as a model quite frequently by other companies.

Mr. North participates, with Mr. Gillie and myself and Mr. Ryan—one of my assistants in charge of advertising—in the preparation of sales campaigns, booklets, mail advertising, and newspaper advertising as well.

He makes a lot of public addresses before schools and societies, particularly on the advantage of proper home lighting, and he has been very successful in that field.

The secretary of the Company is Mr. Sidney Hall, a young man. He has been with the Company seven years. He was made secretary in 1935. He was born in Cleveland, lived there all his life.

He does the usual things that secretaries do. He keeps the official records of the company, records of the corporation, deeds and franchises; he records the minutes of direc- 2048

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tors' meetings.

He is in direct charge of our insurance. He is in charge of a revolving fund which we have to make loans to employees who are in some pressing need of money, and whom we found a good many years ago were apt to get in the hands of these loan sharks at the rate of three per cent. a month, and we set up this fund whereby an employee who had a good record and could show a real need for it, could borrow money from the Company and pay it back, over a period of a good many months out of his pay checks, for which we charged 2049
him no interest rate.

Mr. Hall has the administration of that fund. He also has charge of that pension fund, our group life insurance, that provides for the hospitalization of employees, to which about two thirds of our employees belong.

That movement has had a very wide growth in Cleveland. For a small sum each month, to be deducted from their pay, the employee confined can have his hospital requirements paid for without any great burden at any one time, and Mr. Hall is in charge of that.

2050 *Eben G. Crawford—By Respondents—Direct*

He gets out the reports to the trustees, stock exchanges, S. E. C.; he gets out the dividend checks; he gets out all financial information for clearing houses; he directs the Company's stock transfers to registrars and bond coupon agents.

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He does all the things that a secretary of an organization of this size and scope would be expected to do.

The comptroller of the Company is Mr. R. H. Smith. He
2051 has been with us for—he is 46 years old; he has been with us since 1924.

He came to us from Price, Waterhouse & Company. He has been comptroller since 1928, lived in Cleveland since 1921, lives in Shaker Heights.

He has general charge of all the accounting activities of the Company and prepares the budget, and he controls the work orders and he gets out the job orders, controls expenditures under the budget, has general charge of consumers' billing, accounts receivable and payable, general ledgers, tax reports, and has under him, of course, quite a large super-
2052 visory staff.

Our consumers' accounting department, which get out monthly bills, about four million a year, is under Mr. H. R. Skirving. He has been in charge of that department for many years.

That is a department of about 125 employees, mostly girls. We do mechanical billing and daily billing. Bills go out every day of the month. We don't have, as many companies do, a particular day of the month for mailing out bills.

Mr. Skirving is in charge of that. It is a department with which we have had a good deal of trouble, on account of

—1,037—

having so many girls in it. Mr. Skirving is an old man, who has been there a long while, and he is like a school teacher to them; he does like a school teacher does to a class, and we have had no trouble whatever since Mr. Skirving went in there.

The auditor is Mr. Scholley. Mr. Scholley has charge of the general accounting of books of the Company, getting out of checks, verification of orders and invoices.

He prepares tax reports, financial statements. He has a large staff of accountants under him. 2054

Also under Mr. Smith, the comptroller, is the budget accounting division under Mr. H. C. Patmore—P-a-t-m-o-r-e. He has been with the Company 19 years, has always lived in Cleveland.

He supervises, under the comptroller, all the accounting of the budget. He is in direct charge of the budget for operation, for new construction, for replacements, retirements. He gets out all work orders and sees that those work orders are closed when the work on them is completed.

Also under the comptroller is the construction cost division. That is under Mr. F. E. Stoller—S-t-o-l-l-e-r. He has 2055
been with the Company since 1921 and has been superintendent of construction costs since 1924.

He has in his department 33 employees. He is responsible for the estimates of contruction costs prepared by the Company and the checking of costs and estimates by con-

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tractors. We do our own engineering. We do not—we haven't for many years employed outside engineers for the design or construction of plants or sub-stations or any buildings.

2056 *Eben G. Crawford—By Respondents—Direct*

We have our own architect and Mr. Stoller's department makes the Company's estimates of the cost of any construction project, and confers with contractors as to their estimates and our engineers and contractors' engineers sit down together and as a rule are able to agree on what is the proper cost of a project, and the contract is let usually on that basis.

Mr. Frank M. Cobb, to whom I referred earlier as general counsel for the Company, is a lifelong Clevelander, 66 years old, always lived in Cleveland.

2057 He has been with the Company since 1902. He started with the Company on a fee basis, doing general legal work for the Company in 1902, and in 1914 he was made general counsel for the Company and has been in that capacity ever since. His office is right in our office building.

He has been a member of the Board of Directors since 1912.

He has general control of all our legal work. He retains sometimes outside help, but in all legal matters of the Company he is general counsel for the company.

He devotes all his time to—and has for many years—to
2058 the affairs of the Illuminating Company.

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The claim agent of the Company is Ralph Holcomb— He is 47 years old.

He has been with the Company for 13 years and in charge of the Claim Department for 12 years. He has a staff of eleven—claim agents, adjusters, and so forth. His department investigates all accidents, adjusts claims—he is a lawyer, a member of the bar—prepares court cases for the Company's counsel.

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By the way, we do not insure against public liability. We take care of all our public liability claims ourselves. We think we do it to very great advantage to the Company. We know that we save money over what we would have to pay for public liability insurance.

The costs of our claim department indicate that we make very substantial savings, but we have one very important consideration: we would much rather have the Company settle claims, either against it by some customer or against the customer by the Company, than have an insurance col- 2060
lector, who has no further consideration other than to get the settlement as quickly as possible and as cheaply as possible.

We feel that, by the handling of our claims in that way, we maintain a very much better relationship between customers of the Company and the Company.

It has worked out very satisfactorily. We don't, for instance, insure even our automobiles against public liabil-

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ity. We make all our own settlements on that. We find
that we don't have accidents, because the Claim Department 2061
—Mr. Holcomb—is very, very much interested, and really in charge of our safety work, and we go into safety to the nth degree in our Company.

Our employees are instructed—well, not only in their own protection, because some of their work is hazardous, but in the protection of the public. We have five hundred automobiles, approximately, in our territory. Those automobiles can either be an asset for good will or a liability for bad will, depending on how they are operated.

2062 *Eben G. Crawford—By Respondents—Direct*

Our drivers are instructed along safety lines. We hold safety meetings very regularly. There are quite serious penalties imposed for infractions of the Company's safety rules.

Mr. Holcomb is in charge of all that safety work. As president of the Company I have three assistants—one, Mr. Frank J. Ryan. He has been with the Company since 1923. He has lived in Cleveland since 1905.

Mr. Ryan is in charge of our advertising department. He
2063 prepares and supervises any public statements of the Company. He has much to do with the preparation of the annual report to shareholders, as to form.

He has entire charge of the advertising of the Company. He sits in with me and Mr. Gillie, the vice president in charge

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of sales, and Mr. North, on, oh, dozens of conferences, I would say, each year, on sales promotion.

He is an old newspaper man. He was, for a while, managing editor of the Cleveland Press. Later he moved to New York and was in charge of one of the national syndicating
2064 organizations—I think, the News Enterprise Association, N. E. A., I think. He came to the Company in 1924 as advertising manager and four or five years ago I was empowered by the Board to employ such assistants as I needed, so I made him assistant to the president.

I have another assistant—Mr. Benjamin E. Ling, who is a man about 52 or 53 years old.

(Discussion off the record.)

A. He knows everybody in Cleveland. He keeps in constant contact with various governmental agencies. He is just an

invaluable person for a busy man to have around, getting information on what is going on in the city and what is about to go on, and he has been of great value.

My third assistant—technical assistant—is Mr. Lindseth. I think Mr. Lindseth qualified, told you what his duties were, on the stand.

Q. Now, will you describe the organization which is under Mr. Hough, as vice president and general manager? A. Well, the operating of the engineering and construction organization is all under Mr. Hough. In other words, out of the 2066

—1,042—

about 3,700 employees of the Company, about 3,300 are in the department supervised by Mr. Hough.

Mr. Hough has working with him, as executive engineer, Mr. D. C. Ober—O-b-e-r—who is 49 years old, has lived in Cleveland since 1911, has been with the Company 26 years. He has been three years in his present position.

He is responsible or in charge of all engineering—electrical, civil, mechanical, research and statistical departments, wire relations, and chemical laboratory. As a matter of fact, Mr. Ober could be characterized as an assistant vice 2067
president and general manager.

He is right under Mr. Hough and, in Mr. Hough's absence, he takes complete charge of the departments over which Mr. Hough has jurisdiction.

Mr. Ober has with him, associated with him as a mechanical engineer in executive engineering, Mr. A. A. Casey—C-a-s-e-y—Mr. Casey is 42 years old.

He has been with the Company 16 years. He has lived in Cleveland since 1920.

2068

As I said, we design our own plants and buildings, and Mr. Casey is a mechanical engineer in charge of plant design. In the estimate of cost of plant additions, he makes the designs or supervises the designs, he contacts contractors with Mr. Stoller in charge of the cost estimating division, he supervises the design of plants and the specifications, and he does a great deal of the purchasing in plant construction.

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We are building a plant now, 120 thousand kilowatts
2069 capacity. Mr. Casey has been working constantly on that plant design and on the specifications and on the placing of equipment with various manufacturing companies, and will have direct charge of the construction of that plant so far as the design and carrying out of the contracts, until it is completed.

Mr. Ober also has associated with him as electrical engineer in executive engineering, Mr. W. E. McFarland. He is 44 years old, lived in Cleveland since 1903, and has been with the Company for 21 years.

2070 Mr. McFarland's principal duty is an analysis of rates. We are studying rates all the time. We are studying the results of the application of rates, and Mr. McFarland sets up new rate schedule forms, he advises with me on whether a proposed rate reduction would result in a loss of revenue, what advantages it might have from a sales promotion point of view, and is in general charge of our rate studies.

Under Mr. Ober, as mechanical engineer, is Mr. C. R. Nichols, 63 years old, who has lived in Cleveland since 1924 and has been with the Company all that time.

He is in charge of the building design, in charge of the drafting room, handles the architectural design of plants and sub-station buildings and other buildings being built by the

—1,044—

Company, having the coming architect under his jurisdiction, and he issues all the specifications for buildings.

The electrical engineering department is under Mr. H. L. Wallau—W-a-l-l-a-u.

Mr. Wallau is 63 years old, he has been with the Company 39 years, and he has been in charge of that department for twenty years, lived in Cleveland since 1901. 2072

He is in general charge of electrical engineering design and operation. He represents the Company on association committees.

He is on the Electrical Equipment Committee of the Edison Electric Institute; he is on the Inter-company Electrical Committee; he is on the Electric Switch Gear Committee of the association of Edison Illuminating Companies, the American Standard Association, and the American Institute of Electrical Engineers.

2073

The assistant electrical engineer is Mr. F. Borch—B-o-r-c-h.

Mr. Borch is 61 years old, he has been 19 years with the Company, lived in Cleveland since 1920. He is really in direct charge of the operations of the electrical engineering department, in the design of the electrical ends of power plants, switch houses, transmission systems, and distribution substations.

He is in charge of the selection of equipment for use in

the electrical department, and he cooperates with the Operating Department in all tests and in case of trouble, in finding the reasons for electrical breakdowns. He is in general charge of electrical engineering.

We have a chemistry department; Mr. J. Prescott is at the head of that.

Mr. Prescott has been with the Company 19 years. He has only been chief chemist for the last—for a few months. His predecessor died six months ago and Mr. Prescott has
2075 been in charge of the chemical laboratory since that time.

That laboratory tests fuel to see whether coal companies are delivering the coal that we are buying. We have pretty rigid requirements as to moisture, ash, sulphur contents, and our chemical laboratory tests practically every shipment that is made from each of the maybe 20 or 30 mines from which we get our coal.

They also test paints and insulation and prepare specifications for oils, such as turbine oils and transformer oils, test those oils as to their meeting those specifications. We think it has been a very valuable department in the Company.
2076 Mr. W. W. Godard is the research engineer in charge of research and statistics.

He has been with the Company 18 years, and seven years in his present position.

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He has lived in Cleveland continuously since 1922. He gets out the statistics of the Company, makes analyses of these statistics for various purposes, supervises the statistical part of reports to governmental agencies, gets out statistics showing the results of sales promotion campaigns, and projects trends of production and sales which help to enable

us to make estimates as to the future volume of the Company's business and the future requirements for plant expansion.

We have a wire relations department in charge of a supervising engineer, Mr. B. W. David. He has been with the Company for 12 years, lived in Cleveland since 1915. We have joint ownership agreements on poles with various other companies, telegraph companies.

Mr. David maintains those contacts and is in charge of
those relations. He negotiates sales of jointly owned prop- 2078
erty or purchases of jointly owned property. He keeps a
record of the costs, he checks line surveys for the requirements of the Public Utilities Commission of Ohio, he is in charge of transmission line crossing agreements with railroads, and he has had charge of eliminating interference with radio.

In the early days of radio we had hundreds of calls, blaming our lines and our transformers for putting out static which interferred with performance of radios. That has been generally cleared up. Mr. David has had charge of that de-
partment of the Company's business, and it was quite a seri- 2079
ous public relations problem at the time, but we haven't

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heard much of that in recent years.

Steam Superintendent—Mr. W. H. Aldrich is the steam superintendent of the Company.

He has charge of the steam end of our power plants, production of power, and also of our two steam heating plants. He has charge of the coal in the yards and operation of the boiler and turbine rooms.

He, of course, at the time of the design of a new plant, cooperates very closely with Mr. Casey in the design of a plant as to what equipment shall be used, what type of installation shall be made, capacity, and the pressures and steam pressures and temperatures, so that he has a very responsible position in the design of the power plants as well as complete supervision over the operation of them.

His assistant superintendent is Mr. B. P. Ruetenik. He has been 16 years with the Company, 11 years in his present
2081 job, born and raised in Cleveland, and always lived there. Mr. Aldrich also has under his supervision the superintendents of the power plants.

At Ashtabula, which is our largest power plant at this moment, located at Ashtabula, Ohio, the superintendent is Mr. C. F. North.

He has been 30 years with the Company and in charge of that plant ever since it was built.

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He has lived in Cleveland, or in our territory, since 1906.

In the same capacity at the Avon plant is Mr. F. J.
2082 Friedel, 48 years old, 23 years with the Company, has always lived in Cleveland.

At the Lakeshore plant the superintendent is Mr. F. C. Fletcher, 53 years old, has been with the Company 21 years and has been in charge of the Lakeshore plant for 11 years, lived in Cleveland since 1919.

In charge of the Canal Road plant and the East 20th Street steam plant, under Mr. Aldrich, Mr. R. E. Cooper, 57 years old, has been with the Company 29 years, 49 years in his present position.

Q. What is that? A. 14 years in his present position, and has lived in Cleveland since 1905.

Mr. E. C. Cawrse is production and testing engineer. He is 42 years old, has been with the Company twenty years, has been in his present job three years and has always lived in Cleveland.

He is in charge of the department which maintains the operating efficiency in power plant production. He tests power plant equipment; in charge of system design calculations and is in charge of the general technical staff, power 2084
generation.

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In charge of our electrical department, which has complete supervision over the energy from the time it leaves the power plant until it reaches the customer, Mr. Fred S. Lewis. Mr. Lewis is 71 years old.

He has been 46 years with the Illuminating Company and before that for several years with one of the predecessor companies.

I think he entered the employ of one of the predecessor companies in 1886. He has been in charge of our electrical 2085
department for many, many years.

He operates all the transmission, distribution system sub-stations. He has a load dispatcher. He has 68 sub-stations in his department, and he may supervise the construction and installation of electrical equipment in all power plants and sub-stations.

His assistant for many years has been Mr. A. H. Nicholson who has been with the Company for 34 years. Mr. Nicholson has been with the Company for 34 years, 13 years in his present position.

He has lived in Cleveland since 1889.

Mr. E. E. Noble, assistant general manager, with general supervision over the line department, has been with the Company for 46 years. He came in 1892, when they were building the Canal Road Plant. He has been 20 years in his present position and has lived in Cleveland since 1893. He has general supervision of the overhead line department, the

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underground lines, survey and record departments, the in-
2087 spection department, which is the watchman and all the people engaged in protecting the Company's plants.

His assistant, as general superintendent of lines, is Mr. W. E. Rader, 52 years old. He has been 31 years with the Company, has been in the line department all that time—he has worked his way up through it.

Mr. Noble, as assistant general manager in charge of the lines department, has been ill for two or three years, has been unable to be on the job much of that time, and is about to be retired on pension, having reached the age of 65, and Mr. Rader will have full charge over the line department, over
2088 underground lines, from now on.

The superintendent of overhead lines—Mr. P. R. Ellsworth—50 years old and 31 years with the Company, one year in his present job, born in Cleveland and always lived there. He is just what his title implies, in complete charge of the construction, inspection and operation of the overhead lines, tree trimming activities, service installation and the trouble department.

Superintendent of underground lines—Mr. Alex Douglas —is 49 years old. He has been with the Company for 19

years and in his present position for six years. He has lived in Cleveland since 1918.

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He is in complete charge of all underground maintenance, construction and operation, and underground street lighting circuits, and in charge of the inspection of underground lines.

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The superintendent of Inspection is Mr. B. S. Howlett. 2090
He is 55 years old. He has been with the Company for 31 years, 19 years in his present job. He has lived in Cleveland since 1909. He supervises the watchmen at the Company's power plants and other buildings, supervises their safety men at street openings when the underground department is working under the streets. He investigates reports of current thefts, reports the results of his investigation to the Collection and Claim Department.

(Discussion off the record.)

A. (Continuing) The superintendent of Survey and Record Department is Mr. W. J. Pugh who is 49 years old. 2091
He has been 20 years with the Company and has always lived in Cleveland. He supervises the Survey Department in preparing working drawings for line extensions, for construction of overhead and underground lines, rights of way; he gets permits and consents for tree-trimming, etc. He supervises and maintains all circuit maps for all transmission and distribution of lighting circuits.

An Assistant General Manager is Mr. J. T. Kermode. Mr. Kermode is 63 years old. He has been with the Company

2092 since 1893. He has been Assistant General Manager for three years and previous to that was in charge of the Service Department.

Mr. Kermode has a great familiarity with all of the Company business. He started in as a boy and I think he worked at one time or another in almost every one of the operating departments and he has been for many years in complete

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2093 charge of the Company's service. That includes meter reading, service applications, adjustments of meters, charge of meter testing, in charge of the Company's transportation, properties and buildings, garages, warehouses and shops, in charge of the operation of the office building for the Company, a most valuable man in every respect.

Mr. Kermode has under him in the Service Department, the man who succeeded him as head of the Service Department, Mr. Clarence F. Whiteman. He is 51 years old and has been with the Company 35 years, three years in his present job, born and reared in Cleveland.

2094 Mr. Whiteman supervises all work on the customers' premises, the installation and removal of meters, the meter reading department. He maintains and operates the street lighting equipment and all equipment on the consumers' premises.

In charge of our Stores Department as superintendent is Mr. R. P. Snow. He is 47 years old and has been with the Company for 13 years. He has direct supervision of all stores and employees. He supervises both warehouses—we have two warehouses, one on the east side of Cleveland and one on the west side of Cleveland. He is in charge of the

records, stores, materials and supplies, and in charge of requisitions for such stores and materials.

As Fuel Agent and Civil Engineer in charge of Building Construction is Mr. F. C. Loweth. He has been with the Company 19 years and has lived in Cleveland since 1912.

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Mr. Loweth buys all the coal that the Company consumes. He has charge of the routing of fuel, tracing of lost freight and making freight claims. He is also a civil engineer in charge of new building construction and alterations. He is 2096
in charge of the maintenance of our branch offices throughout the territory. He is our contact with the Federal and Municipal authorities on engineering work in the matter of getting permits for buildings from the Zoning Commission. He has general supervision of the transportation and automobile shops.

The Superintendent of the Automobiles, Garages and Shops is Mr. George H. Skinner. He is 54 years old and has been with the Company for 34 years, three in his present position. He was born and reared in Cleveland. He is in 2097
charge of all our automotive equipment, passenger cars, trucks, tractors, trailers, cranes, pole diggers. He is in charge of the garages. He is in charge of the moving of supplies as required between Company properties. He is in charge of our cable reclaiming department, transformer repairs, and tool repairs.

The Purchasing Agent of the Company is Mr. W. H. Hartman. He has been with the Company 35 years, 29 years in his present position. He has lived in Cleveland since 1900. He is in charge of purchasing all supplies and

2098 equipment and he disposes of obsolete material and scrap for the Company, scrap metals.

The Pay Master is Mr. H. G. Elder, 51 years old and 28 years with the Company, 20 years in his present job. He

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has lived in Cleveland since 1912. He is not only Pay Master but he is in charge of personnel, that is the hiring of personnel. He interviews applicants for positions. If a department needs an employee of one type or another they
2099 tell Mr. Elder what the qualifications are of the man or woman that they need and he interviews applicants, selects the ones he thinks might be suitable and sends them to the department head for his final judgment on whether or not they should be employed. He is responsible for the employment and payroll records and Social Security Board reports.

Mr. Browning: Mr. Examiner, could we take a recess at this point?

The Examiner: Yes, we will have a short recess.

(Whereupon, a brief recess was taken.)

2100 The Examiner: You may proceed.

By Mr. Browning:

Q. What has been the Company's record of employee relationships? A. I think it has been about as fine as it could have been. I mean, I think our relationship to the employees and the employees among themselves is about as fine as could ever have been in any company. We never have the slightest disagreement with our employees in any respect. There has never been a union in the Company. The employees have

never suggested that there might be. Personally, I think I am as much interested in employee relationship as I am in

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any branch of the Company work. I know—I can't say I know all of them but I know a great many of them personally. I am in constant contact with them.

While we are non-union in our operation, we get along extremely well with the trade unions in Cleveland because all our construction work done by contractors is done by the union labor. 2102

Q. What is your standard work week? A. We have been working 40 hours a week, that is eight hours for five days, ever since 1933 when the N. R. A. became effective. We were working a 44-hour week before that but we found that after getting adjusted to the 40-hour week it was entirely satisfactory in every respect. We pay time and one-half for overtime and our employees have vacations with pay.

Q. Do you interest yourself in safety in the working conditions? A. I think we are strictly active in safety work. We have safety committees in practically all departments of
the Company in which there is any degree of hazard. 2103
Those committees meet frequently. There is competition among men for the best safety records.

There are in some cases some rather severe penalties for flagrant infraction of safety rules. The safety work has been not only extremely interesting to the men but has had a very satisfactory result. For instance, between 1925 and 1939 accidents resulting in any disablement decreased 81 per cent. I think that in 1939 possibly we had as low a rec-

—1,057—

ord of disabling accidents as any company in the country

At the beginning of 1940 we had 114 Company drivers who had driven more than ten years without any accidents for which they were responsible. We have been leading up in the Cleveland Safety Council records for fleet operation. We have been right at the top year after year for operating a big fleet without accident to the public.

We maintain a dispensary in our main office building. There every morning from 8:30 for as long as they are required, there are two doctors, both eminent doctors. We
2105 have four trained nurses in that Cleveland Dispensary. We have visiting nurses who visit the employees at home when there is any sickness among the employees. We have one visiting nurse in the eastern district. In 1939 there were 4,500 calls in the dispensary. In 1939 there were 3,900 calls at homes of employees. We use all possible safety appliances both in our shops and in the field.

In line work the employees are given all the precautions that are known to the industry to prevent accidents. In the last three years we have adapted and trained our men in applying resuscitative methods to a man who has been
2106 shocked on a pole before they bring him down.

We did not find this out but it was found by other companies.

Q. Do you remember where you borrowed that idea? A. I think we got that idea from a report in one of the maga-

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zines that we saw that started in Pittsburgh and then Milwaukee took it up. I think Milwaukee went into it before we did. We sent men around to various companies where

it was being applied to see whether in their judgment it was worthwhile doing it and we came to the conclusion that it was.

Now they go to work on a man before they lower him to the ground and the theory is that the interval between the time of the shock and getting him down to the ground is a critical one and the record has been, I think, very satisfactory as to bringing men back to consciousness. I am merely saying that because we try to keep abreast of all developments in safety for employees. 2108

(Discussion off the record.)

By Mr. Browning:

Q. Do you support any recreational activities for your employees? A. Yes, we have three welfare associations, the Men's Welfare Association with about 2,300 or 2,400 members, the Women's Welfare Association with about 400 members, and the Illuminators, that is the Colored Welfare Association. They call themselves the Illuminators. I am the president of that organization. 2109

The employees pay nominal dues of $1.00 a year and the Company makes up the difference in the budget. Our contributions for the Men's Welfare Association runs around $1 ,000, for the Women's Association I would say it ran about $2,000 a year, and for the Illuminators about $700. The Illuminator's cost per head is very much higher than that of

the others. They have a great time. In the Men's Welfare Association we fixed up a room for them in one of our garage buildings. They gather there every Tuesday night. You

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will find 300 men playing pinochle and 150 men playing duplicate contract bridge. There will be about 20 Ping Pong tables in operation. That goes all winter long. Then we provide bowling and we have bowling once a week that we rent alleys for.

They have a golf league within the Company and a golf team in the Industrial League and I may say that the Illuminating team won the championship in that Industrial League for 1938-39.

2111 We have Company picnics. I go to the golf—we have two golf matches within the Company for which we put up prizes, one in the spring and one in the fall. Until this last year I have always participated in that tournament and I have noticed that they always put up their best player to give me a beating and he always does it.

Our recreational relations with the employees are a very happy thing. We have this big picnic at the Euclid Beach in July of every year, at which everybody who is not absolutely required to be working attends. The picnic opens about ten in the morning and lasts until the evening. We get 11 or 12
2112 thousand people there for that day.

We make arrangements with the Euclid Beach Park to buy scripts of tickets for the various rides and roller coasters, etc., and give them to children. One of the features of that picnic is a dinner that I give at noon to the men

—1,060—

retired on pension and their wives. It is about the only chance I have to maintain contact with these men who have spent their lives in the Company and are maintained on a pension. At each annual picnic I give a dinner and we get all those old fellows in there with their wives. On that day

also I present to employees who have completed 25 years service, a gold service pin of the Company. They get a great kick out of that.

I used to throw out the first ball at the baseball game but I have given that up. Really that picnic is a very fine thing and we are told that it is the best operated and arranged picnic that comes to Euclid Beach. We go there every year in July.

Q. Have you a pension plan for your employees? A. We have had since 1931 a pension plan funded by the Prudential 2114
Life Insurance Company. At the time I was secretary of the Company and before I took over the management, one of the things I did from about 1929 until 1931 was to study pension plans. We felt that we had to put in pensions for our employees and we put a lot of time on it. We employed consultants from Philadelphia who were, I think, the leading experts in pension study and we finally evolved a plan. We submitted that to two insurance companies, the Metropolitan and the Prudential, and after much consultation in New York with the representatives of these companies we finally settled on the Prudential Insurance Company. 2115

That plan provides that any male employee having 20 years service with the Company, reaching the age of 65,

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receives an annual pension of 2 per cent. of his total earnings while with the Company, a minimum of $40 a month, a maximum of $6,000 a year.

The same thing applies to women employees who have been 20 years with the Company and have reached the age of 60. An employee must retire at 65 unless by executive

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action he is asked to continue and we have had only two exceptions to the rule of employees retiring at pension age. One of those was Mr. Mills, Vice President and Treasurer. The other was Mr. Fred S. Lewis, in charge of the Electrical Department. Those were both men with full strength and vigor when they came to the age of 65 and they felt that they could continue and would like to continue and so they are still working.

On the other hand, in order to protect them against any
2117 possible change in the pension plan I arranged for them to be given their pension from the insurance company as if they had retired and so they have that and then we have made up the difference in their pay on the Company pay roll so that if the plan were abandoned or modified in any way they would not suffer from having stayed on in the employ of the Company.

That plan is non-contributory from the employees. We estimated by actuarial calculations that if the Company would put up $300,000 a year with the insurance company that we would take care of all our current pension liabilities
2118 and amortize our accrued liability, the liability that had been built up before the pension plan was put in effect, in 25

—1,062—

years. We used life tables, mortality tables, and we erred in one direction. We could not actuarially estimate what turnover would be. We took our own Company records on turnover and that of other companies in the industry and arrived at what we thought would be the turnover discount, the men working for us in 1931 that would not stay there until they became of pension age.

 2119

Just at that time the depression came on and every man who had a job kept it, so we have had no turnover in the nine years that have elapsed since the plan was put into effect. So as a matter of fact our pension reserve is somewhat in arrears as far as the amortization of the accrued liability is concerned. If we ever get to the place where we are making a little money I think we will put a little more into that reserve. It was the first utility company, I think, that funded its pension plan with insurance companies and that was done early in 1931. 2120

Q. Do you insure the life of your employees? A. Yes, we have insured since 1916 every employee for $1,000 in the Aetna Life Insurance Company, at no cost to the employee. I think that plan could well be modified so that the employee might participate in the cost of it and get a somewhat larger amount of insurance but it has been satisfactory to the employees and we never have changed it. It has been in operation since 1916.

Q. Does the Company maintain a special fund known as

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the Employees' Fund? A. It has for a great many years maintained a practice which we have called the Employees' Fund, of giving employees additional pay at the end of each year. For many years that has been on this basis, that all employees making less than $3,780 a year have credited in a savings account five per cent. of their total earnings for that past year. That is accumulated in the hands of three trustees, Mr. C. W. Mills, Mr. H. W. Hough, and myself.

The fund is invested in the bonds of the Company and some of it in preferred stocks of the Company and in some

savings accounts. There is something over $1,000,000 in the fund. As I say, each year the employee has credited to him in his little book like a savings book, five per cent. of his pay during that past year and interest at two per cent. on the accumulated balance. If he stays with the Company for ten years he gets that money in cash at the end of the ten-year period. If he leaves the Company before the 10-year period is up, after giving required notice of his intention to leave, he gets the accumulation in the fund one year after he leaves.
2123 If he is discharged for cause he forfeits anything that may have been credited to his account in the fund. It has been a very happy thing for the employees.

I think we have paid out something like—since 1904 when we started, we have paid out $5,250,000. Last year 253 employees who received their 10-year accumulation got $240,000, or an average of about $950 apiece. That 10-year accumula-

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tion coming to them in cases that I know of, has been the initial start on the payment for a lot or payment for a home. It has bought a great many automobiles and has just worked
2124 beautifully both from the standpoint of the employee and the Company.

Q. Do you grant sick leave to your employees? A. Yes, we do. We do it on a schedule. We used to do it only to salaried employees, but in 1935 we extended it to our hour employees as well. The provisions are like this. Any employee who has had more than five years continuous service gets full pay for three months, followed by half-pay for one month for each year of service, with a maximum of 14 months. Employees with more than three but less than five,

get full pay for two months, followed by half-pay for one month for each year of service.

Employees of more than one year but less than three years get full pay for one month, followed by half-pay for one month for each year of service.

Employees with less than 12 months service get two days' full pay for each month of service.

Now, an illness where an employee exhausts the sick leave with pay he is kept on the pay roll as an employee to enable him to maintain his pension and group insurance records. In 2126
other words, if he is sick for a longer time than for which we pay him we still keep him on the pay roll as an active employee indefinitely until we learn that he has died or moved

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away so that he will not forfeit his pension rights or his group life insurance.

Q. Could you tell us what is the average length of service of your employees? A. The average length of service of supervisory employees, that is employees in positions of responsibility, is in excess of 23 years. Those men have been 2127
in the present jobs for an average of more than ten years. Of all employees, 77 per cent. have been in the employ of the Company for five years or more; 64 per cent. for 10 years or more; 13 per cent. for 20 years or more; two per cent. for 30 years or more.

For male employees the average length of employment is 13 years. For women employees the average length of employment is 9.3 years. 13 per cent. of our present employees have been in the service of the Company for 20 years and 27 per cent. of the employees of 20 years ago are still with us.

Mr. Browning: I should like to have this chart which is entitled, "The Cleveland Electric Illuminating Company Organization Chart", marked for identification as Respondents' Exhibit No. 30 for identification.

The Examiner: All right.

(Organization chart marked Respondents' Exhibit 30 for identification.)

2129 *By Mr. Browning*:

Q. Mr. Crawford, was this chart prepared from the records of the Company? A. It was.

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Q. And it correctly sets forth the facts shown there? A. It does.

Mr. Browning: I offer this chart in evidence as Respondents' Exhibit No. 30.

Mr. Binford: No objection.

The Examiner: All right. It is received in evi-

2130 dence under that number.

(Respondents' Exhibit No. 30 for Identification, received in Evidence.)

Mr. Browning: I should like to have marked for identification, a table entitled "The Cleveland Electric Illuminating Company Funded Debt."

The Examiner: All right. Let it be so marked.

(The table described was marked Respondents' Exhibit No. 31 for Identification.)

Mr. Browning: The record might show that this consists of four pages, Mr. Examiner.

The Examiner: Yes.

By Mr. Browning:

Q. Mr. Crawford, was this table, Respondents' Exhibit No. 31, prepared from the books and records of the Company? A. It was.

Q. Does it correctly set forth the facts therein stated? A. It does. 2132

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Mr. Browning: I offer this in evidence as Respondents' Exhibit No. 31.

The Examiner: It is admitted in evidence under the number assigned to it, Exhibit No. 31.

(Respondents' Exhibit 31 for Identification, received in Evidence.)

By Mr. Browning:

Q. Mr. Crawford, will you tell us when The Cleveland Electric Illuminating Company was incorporated? A. The 2133
Cleveland Electric Illuminating Company was incorporated as The Cleveland General Electric Company in 1892. Its name was changed in 1893 to The Cleveland Electric Illuminating Company.

Q. It has had a continuous corporate existence therefore since 1892? A. That is correct.

Q. Will you tell us briefly something regarding its predecessor companies? A. There were in Cleveland in 1892, two electric companies, the Brush Electric Light and Power Company, incorporated in 1881, and The Cleveland Electric

2134

Light Company, incorporated in 1884. The Brush Electric Light and Power Company was primarily a street lighting company. Mr. Charles F. Brush had invented the electric arc light and he formed this company primarily to light the streets of Cleveland and to light the stores with arc lights.

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In 1884 another group of people in Cleveland acquired the license of the Thompson-Huston patents for incandescent lighting and they started in the business of lighting homes
2135 and stores with incandescent lights.

The Cleveland General Electric Company, later The Illuminating Company, was formed in 1892 to merge these two companies. The charters of the two companies were kept alive for a number of years and were finally allowed to lapse.

Q. Were these two predecessor companies, the Brush Company and The Cleveland Electric Light Company, the two original electric companies in Cleveland? A. Yes, they were the only two in existence at that time.

Q. Now, did you also acquire the assets of another corporation in 1911? A. Yes, that is true. There was organized
2136 in 1907 a company called Cuyahoga Light Company which operated in a very small district down near the public square in Cleveland. It came about through the owner of a building putting in a heating and lighting plant and then extending his services into other adjacent buildings.

In 1911 the property of that company or the company, itself, was acquired by The Cleveland Electric Illuminating Company. The Company was later dissolved.

Q. Has the Company at any time organized subsidiaries which are no longer in existence? A. Yes, the Company has

—1,069—

had three such subsidiaries. The Power Construction Company was organized in 1920 and it acquired the site of The Illuminating Company's Avon generating plant. It acquired property from the Avon Railroad Company which was also organized by the Company. It held and disposed of parcels of land bought for the use of the Company and was used as a real estate company to avoid making it necessary to get releases and make deposits under the Company's mortgage indenture for pieces en transit, as it were.

If we needed half an acre we might have to buy three acres to get it. The Power Construction Company would buy the three acres, take title to it, transfer the half-acre to the Illuminating Company and then dispose as it could of the surplus property. It was dissolved in 1938 and the assets transferred to the CEICO Company which is a subsidiary still in existence. 2138

The Avon Railroad Company was organized in 1935 with a capital of $255,000. It bought a defunct railway, right of way and the rails, which ran from the site of the Avon plan where there had been formerly a small power plant and an amusement park, and crossed at a right of way across three main line railroads. The Avon Railroad Company was incorporated to deliver coal to the Avon plant by making contacts with these three roads, the Baltimore & Ohio, the Nickle Plate, and the New York Central. It was dissolved in 1927 and the switching track was conveyed to the Illuminating Company and the other track disposed of. The balance 2139

of the property was transferred to the Power Construction Company.

2140 *Eben G. Crawford—By Respondents—Direct*

The Illuminating Securities Company was organized in 1925 with a capital of $50,000. At that time we had marketed about $15,000,000 of 6 per cent. preferred stock. We had done that without underwriting and had sold a great deal of it to about 6,000 stockholders living in our territory.

Many of those holders had never owned any corporate securities at all and were not familiar with brokerage houses or stock exchanges or how to buy and sell, and this company was organized to provide them with a place where they could
2141 add to their holdings of the 6 per cent. preferred stock or dispose of it. It was kept alive until 1937. It provided a market for fractional shares of both common and preferred stock, following a reorganization of the Company's capital structure in 1935. It served a useful purpose we thought up until that time. It was inactive thereafter and was dissolved in 1937.

Q. I believe Mr. Lindseth testified that The Illuminating Company has also acquired by purchase the assets or stock of seven other companies from third parties. Is that correct? A. That is correct.

2142 Q. And those companies were all dissolved following their acquisition? A. That is right.

Q. He has also testified, I believe, that The Illuminating Company today has two subsidiaries, the Power and Light Building Company, and the CEICO Company. A. That is

—1,071—

correct.

Q. It has no other subsidiaries? A. It has no other subsidiaries.

Q. You have told us about the organization of The Illuminating Company in 1892. Will you outline briefly the

history of the Company since that time? A. In 1893 the gross revenues of the Company were $189,000. Of that $189,000, $19,000 became net income. Bond charges were $30,000 and preferred dividends, 15.

Q. Fifteen-what? A. Fifteen thousand dollars.

The Company, even during the first year, earned its fixed stock and dividend requirements and has done so ever since. In 1893, just to show the growth of the Company from 1893 until 1914, which was largely the period of transition from gas or oil to electricity for lighting in the homes—in 1893 2144
the physical property amounted to $600,000 with gross revenues of $189,000. Five years later, in 1898, physical property had grown to $1,851,000, a 200 per cent. increase, and the gross revenues had grown to $336,000, a 77 per cent. increase.

In 1903 the property account had grown to $2,909,000, a 57 per cent. increase, and gross revenues to $854,000, a 154 per cent. increase.

In 1908 the physical property was $6,871,000, an increase of 136 per cent. for the five-year period. The gross revenues,

$1,643,000, a 92 per cent. increase. In 1914 the physical property was $17,185,000, an increase of 150 per cent. The gross revenues had reached $4,256,000, an increase of 159 per cent.

This great growth in physical property necessitated an almost continuous raising of capital in that period from 1893 to 1914. There were 19 sales of bonds aggregating the principal amount of $11,020,000, five sales of preferred stock aggregating $550,000 par value; 11 sales of common stock aggregating $7,762,700.

Q. Mr. Crawford, does Respondents' Exhibit 31 show the detail of all the issues and retirements of funded debt, preferred stock and common stock, throughout the Company's history? A. It shows the dates of issue, the amounts of those issues, the price realized by the Company, the date of redemption, if redeemed, and the price at which they were redeemed, of all issues that have ever been issued by the Company since 1893.

Q. Now, will you tell us about the period from 1915 to
2147 1919. A. That was a period of very rapid growth, of course, because it was a period in which the World War fell. Starting in 1914 the physical property was $17,185,000. That grew until in 1919 it was $31,437,000, an increase of 82 per cent.

In 1914 gross revenues were $4,256,000. In 1919 they were $9,550,000, an increase of 121 per cent. During this period all financing was done by the issuance of bonds be-

—1,073—

cause in that period no equity money seemed to be available, so that in that period $11,300,000 principal amount of bonds
2148 were sold

In 1916-17, $3,300,000 principal amount of bonds were sold at a money cost to the Company of five per cent. In 1917 an additional $50,000 principal amount was sold at a cost of 5.2 per cent. A further $25,000 principal amount was sold at a cost of 5.6 per cent.

In 1917 also $1,490,900 principal amount of bonds were sold at a money cost to the Company of 5.4 per cent. $3,935,-000 of principal amount of bonds were sold at a cost of 6.2 per cent.

 2149

In 1919, $2,500,000 principal amount of bonds were sold, at a money cost to the Company of 5.7 per cent. That makes a total of $11,300,000 principal amount of bonds sold in the period between 1915 and 1919.

Q. What was the result of these issues on coverage of interest charges? A. Well, by increasing the funded debt at that rate, it had to be done at a much faster rate than earnings. The coverage of interest declined from 4.3 times to 2.4 times.

Q. What happened in the post-war depression period? 2150
A. We have called the post-war depression period the years 1920-21. In those two years physical property increased from $31,440,000 in 1919 to $41,200,000 in 1921, an increase of 31 per cent.

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The gross revenue increased from $9,390,000 in 1919 to $13,000,000 in 1921, a 39 per cent. increase. With this growth additional capital funds were required and at that period they were exceedingly costly. The Company, in 1920, sold $5,000,000 principal amount of 7 per cent. first mortgage collateral bonds, due in 1935, at a money cost of 8.3 2151
per cent. It sold in 1921, $5,000,000 principal amount of 7 per cent. sinking fund gold debenture bonds due in 1941, and callable after 1931, at a cost of 8.1 per cent. It sold $4,000,000 of 6 per cent. preferred stock at a cost of 8.7 per cent in 1920.

Q. Now, will you tell us about the period from 1922 to 1930? A. 1922 was the year in which the North American Company appeared in our picture. They acquired control of our Company by purchasing $10,940,100 par value of our common stock, or a total of 72.7 per cent.

Q. They have had control of The Cleveland Company ever since? A. Continuously.

Q. Yes. A. I am speaking about the period now from 1922 to 1930. In that eight years of course was the period of greatest growth in our Company. The physical property increased from $41,000,000 in 1921 to $128,000,000 in 1930. Gross revenues increased from $13,000,000 to $26,480,000.

—1,075—

This was partially due to growth within our territory up
2153 until about 1926. Our territory principally comprised Cuyahoga County in which Cleveland is located. From then on we began to expand to the east so that by 1930, the end of this period, the territory had greatly increased in area, although not proportionately in property additions in that territory and revenues derived in that territory, but to provide for this growth and for this extension of territory and the acquisition of the property in this territory into which we extended there was a tremendous amount of capital required.

For instance, 1922 the Company issued $5,281,800 par
2154 value of common stock. It sold at $100 per share. In 1923, 1924 and 1925 the Company sold $15,281,700 of par value of preferred stock that sold at a cost of 6.12.

Q. Per cent.? A. Per cent. That is contrasted with these sales mentioned before at money costs over 8 per cent. just three or four years earlier.

In 1924 the Company issued $1,584,500 par value of common stock that sold at $150 per share. $50 per share of that went into capital surplus.

In 1924, $11,500,000 principal amount of bonds were sold at a cost to the Company of 5.2 per cent.

 2155

In 1926, $10,000,000 principal amount of bonds were sold at a cost to the Company of 5.03 per cent.

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In 1930, $17,029,800 of stated value of common shares were sold at $20 per share, which was the stated value. That is a total of securities issued in that period of $60,677,800. There were retired within the same period, $4,000,000 par value of 8 per cent. preferred, issued in 1920. That was retired in 1923.

During this period, of course, the Company's financial 2156
condition greatly improved. There was a marked shift in the distribution of capital. The debt shifted from 62 per cent. of the total capital to 36 per cent. Preferred stock rose from 11 per cent. of total capital to 12 per cent. and the common from 27 per cent. total capital to 52 per cent. The ratio of debt to physical property decreased from 67 per cent. to 35 per cent.

The coverage of interest charges increased from 2.2 times to 4.4 times.

Q. Did this result in a greater investment per dollar of 2157
gross revenue during this period? A. Yes, back in 1922 our ratio of property to revenue was 3.27, and in that period of 8 years it increased to 4.86. In other words, it took $4.80 invested in physical property to produce a dollar of revenue.

Q. Were any earnings left in the business during this period from 1922 to 1930? A. Yes, the dividend payments of the Company during that period were moderate and substantial surplus was accumulated. In 1928, $16,629,000 of surplus was capitalized and frozen in a stated value of com-

—1,077—

mon stock which meant putting back in the business most of the surplus accumulated during that period.

Q. What were the total undistributed earnings during that period? A. They were $27,788,600.

Q. Did your business continue to increase during the period? A. It increased to a very marked degree. The annual sales increased from 500,000,000 kilowatt hours per year to 1,200,000,000 kilowatt hours. The average revenue per kilowatt hour, however, declined from 2.47 cents to 2.07

2159 cents.

Mr. Browning: I have reached a convenient stopping point, Mr. Examiner.

The Examiner: All right. We will recess until two o'clock.

(Whereupon, at 12:30 o'clock the hearing recessed, to reconvene at 2:00 o'clock p.m.)

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2160

AFTERNOON SESSION

(Whereupon at 2:00 P.M., August 15, 1940, the hearing resumed.)

EBEN G. CRAWFORD the witness on the stand at the time of recess, resumed the stand and testified further as follows:

Direct Examination (Continued):

The Examiner: We will resume the hearing. 2162

By Mr. Browning:

Q. Will you now describe for us the period from 1931 to 1939? A. Of course that period from 1931 to 1939 covered the period of the great depression and the coming out of it, and the minor depression of the fall of 1937 to 1938, in those figures.

The growth of the business slowed down greatly, but it did continue. The fixed property account increased from 128,600,000 in 1930 to 143,500,000 in 1939—a growth of 11 per cent. 2163

Revenues increased from 26,480,000 in 1930 to 29,630,000 in 1939—an increase of 12 per cent.

Q. Did your rates continue to decline? A. Yes.

Q. And your production increased? A. Yes. The annual

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sales increased from a billion two hundred million kilowatt hours in 1930 to a billion six hundred million kilowatt hours in 1939.

The average revenue per kilowatt hour declined from 2.07 cents in 1930 to 1.77 cents in 1939.

2164 *Eben G. Crawford—By Respondents—Direct*

Q. Did you refund any of your capital during this period? A. Yes, we had a number of refundings. In 1931 we retired the five million 7 per cent. sinking fund debentures that were issued in 1921. They could not be retired earlier because of the covenants on retirement incurred at the time of issue.

In 1935 we sold 40 million of 3¾ per cent. first-mortgage bonds and retired a like amount, 40 million dollars of five per cent. bonds.

In 1935 also we retired 15,281,700 par value of six per
2165 cent. preferred stock, and issued in its place 4½ per cent. preferred stock, and in 1935 we reclassified certain common shares into $10,217,880 par value of preferred stock.

Q. Did your financial structure continue to improve? A. I would think it improved quite substantially. The ratio of debt in this period to total capitalization declined from 36 per cent. to 34. The ratio of debt to physical property declined from 35 per cent. to 28, and the coverage of interest changes increased from 4.4 times to 5.9 times.

—1,080—

2166 Q. You had a further refunding recently? A. Yes. In July of this year we sold 50 million dollars of 3 per cent. bonds, and retired 40 million dollars of 3¾ per cent. bonds, thereby acquiring ten million dollars of additional funds for plant expansion.

These 3 per cent. bonds were sold on the basis of money cost to the Company of 2.83 per cent., went to the public on the basis of 2.73 per cent.

As far as I know, that is the lowest cost long-term borrowing of an amount of that size by any utility company. We were very fortunate.

Q. Now, will you state what capital securities you have outstanding today? A. We have outstanding as of today 50 million principal amount of first mortgage bonds, 3 per cent. series, due 1970. We have outstanding also $25,498,-900.00 of preferred stock, cumulative preferred, and we have outstanding——

Q. (Interposing) That is 4½ per cent.? A. Four and one-half. $4.50 dividend.

We have outstanding common stock, with a stated value of $40,871,520.00, with an earned surplus of $14,888,000.00. 2168
A total capital structure, then, of $131,258,420.00, of which 38 per cent. is represented by debt, 19 per cent. by preferred stock, 31 per cent. by common stock, and 12 per cent. by surplus.

—1,081—

Q. Does your public utility business differ from other businesses in the fact that service must be rendered, Mr. Crawford? A. I think it varies greatly from ordinary industrial and commercial business, in that respect. In the first place, we must give instant service when called upon by consumers, and in the second place, we must be able to 2169
provide in advance the necessary facilities to give that instant service.

Consequently we have to do a lot of long range planning of plant expansion, keeping in mind always having sufficient capacity to meet any demands made upon us with a sufficient reserve capacity to insure the ability to give service, even with important units, unavailable either through accident or through requirements of maintenance.

I don't know any other business that is quite so constituted. We must know, or must estimate, from two to three

years in advance what our demands are going to be, and we must make the provision to be able to meet those demands. We can't give a deferred delivery, such as many businesses can. It is not an infrequent thing to order a machine tool and to say it will be delivered in two months or three months. It is not an uncommon thing for a woman to go into a shoe store for a pair of shoes, and, if they don't happen to have the style or the size that she wears, they say, "We will get

—1,082—

2171 them for you in two or three weeks." She goes along satisfied with that.

Our customers demand that when they flip a switch, that the lights will go on, or that the range will cook, or that the iron will iron. So I think, in that respect, our business is different in its requirement for long range planning, the long time procurement of the necessary facilities.

It takes a long time to build a power plant. It takes a long time to get a right of way for the extension of a transmission line and to build that line. So that I suppose we are probably very much in advance of most businesses in de-
2172 termining what our program of growth and expansion is to be. We have no control over ourselves.

We can't say, "We don't want the business to get any bigger; it is big enough." We can't say that—making a line extension to a factory—that we are not certain that that factory will be a commercial success and that we simply have to run the line and make the connection. If we didn't want to do it, the Utilities Commission would force us to do it, and that is just one of the risks of our business.

There is another thing requiring advance planning. We never know when something new will be discovered which

will increase the use of electricity. We didn't know in advance, when the radio was discovered—invented—what a tremendous user of electricity that would be.

—1,083—

We didn't know that the refrigerators would go into most homes, when somebody announced an electric refrigerator, and we don't know today what the next thing is that may come tomorrow, that will increase the demands on our facilities.

It is one business that doesn't seem to be within the control of the management, as to how fast it must grow, and how fast capital must be provided to take care of that growth. 2174

Q. You must forecast your demand for some period in advance? A. Yes. We try to forecast our demand from three to five years in advance, but it must necessarily be a good deal of guess.

We have this other situation, too, that, having provided these facilities to meet a period of growth, then, should there come a depression ~~or a~~ falling off in use of our facilities, we have the problem of trying to keep those facilities working and producing, and that is a job of sales promotion in trying to increase the use of facilities already provided in advance for a greater use which has dropped off. 2175

Q. I want to get clear: What is your approximate minimum time in which you can increase your generating capacity? A. Well, that varies, Mr. Browning. There was a time back in the early thirties when the turbine plants of the

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manufacturers were practically idle, that you could get deliveries pretty quickly, and the delivery of a turbine possibly in from 12 to 13 months. Well, now, with the freight pick-up

that has come along, and particularly the preparation for preparedness program, or the defense program, the turbine shops of the manufacturers—and there are only three large shops of that character—General Electric, Westinghouse and Allis-Chalmers—they have their schedules pretty well filled up.

For instance, we ordered a turbine—the first turbine in this new plant that we are building. We got a 15 months delivery date on it and in the interim of six or seven months
2177 between that and when we ordered the second turbine, that period had jumped to 18 months, so I would say, in times like this, that you couldn't count on having a new power plant ready for operation in less than two years.

In other words, the second turbine that we are proposing to put into this new plant at East 70th Street will be delivered, if they keep their schedule—if some priority orders don't come between us and the turbine—will be delivered in April of 1942, and be ready for service in the fall of that year.

So that it would be a two-year—it is a two-year opera-
2178 tion to get that turbine built and in service, with the boilers

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and the condensers, and all the auxiliary equipment.

Q. So that it comes down to the fact that you not only must accommodate the customer instantly, when the customer requires service, but that you must have guessed two years in advance that the customer would require service? A. Yes. With the strong possibility of guessing it wrong.

Q. In that connection, is the Cleveland load subject to variations with changes in business conditions? A. Yes. It is quite subject to such variations. I think the more indus-

trialized a community is, the more the electrical demand varies up and down with increased prosperity or—up with increased prosperity or down with depression. Consequently, Cleveland, being a highly industrialized city, has not the same stability of load that a city like St. Louis or Milwaukee would have.

On the other hand——

Q. (Interposing) How would it compare with Washington? A. Oh, Washington is a boom town. There is no comparison between Cleveland and Washington. Judging from 2180
the statistics that we see currently from the Washington Company they haven't done so badly in the last eight or nine years.

On the other hand, Detroit, being even more highly industrialized than Cleveland, the swings from high to low

are even greater than they are in Cleveland.

When Detroit was in the heart of the depression their business was off considerably more than ours was. Since recovery has taken place, their upswing has been considerably higher than ours has been. 2181

So that we have—in a word, we have very wide swings up and down, as business conditions change.

Q. What problem confronts you, then, as president of the company, when you get one of these downswings that you have had? A. Well, that is, of course—as president of the Company, that has been my principal problem during the period of my presidency, because I took over the presidency of our company at the very depth of the depression.

I think the biggest job I had, and certainly the one to which I gave a great deal of time, was in sales promotion,

to try to—we had the plant capacity, we had the distribution and transmission lines, we had a certain territory; that territory would only produce so much business, and I think of it in this way, that it would be like a farm. We have a farm of a certain acreage. We had the barn and we had the tools and the tractors and the plows and all the necessary things to reap and take care of all the business that could be developed, and the grain that could be grown on that farm, and I would think of sales promotion as possibly the

2183 —1,087—

fertilization that we would put into that farm to try and get more crops out of it, so that in the time—at the time I took over the management of the Company, we redoubled our sales activities, our sales promotional activities, and we did everything that we could think of to get these facilities, which had been bought at the time when the load was high, to get them back to work.

I think we fertilized the land as strongly as we could and I think we are getting pretty good crops from it now, but it has taken a great deal of my thought—I would think pos-
2184 sibly more than any one thing except financing.

Q. Has your demand for capital been constant? A. Well, the demand has been continuous, but it is not constant in the sense that we may require about the same amount of new capital each year.

For instance, as I stated a little while ago, we had what proved to be an excess of generating capacity when the depression set in, and consequently the demand for capital investment, until we again brought consumption up toward the safe capacity of those existing plants, was not great.

In 1939, however, when we were faced with the prospect of building a new plant, our construction budget jumped, and in 1940 the continuation of that new plant construction, together with the projected construction in '42, will mean that our construction budget in '41 will be on the order of

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ten million dollars per year, so that I would say that there was a continual demand for increased investment, but we don't get the necessary money to make that investment year
by year. For instance, in—I have some figures here—from 2186
1931 to 1939 the average construction expenditures—by that I mean net expenditures; construction less retirements—amounted to less than $2\frac{1}{2}$ million dollars a year.

In 1924 and 1926, and from 1928 to '30, they exceeded nine million dollars a year. In 1926 and 1930, each of those two years, the production budget was 16 million dollars. Now, those two years involved the building of the large power plant, one at Avon in 1925 and 1926 and one at Ashtabula in 1929 and 1930.

Since then, until we put in this new—started this new 2187
plant last year, there have been no unusually large construction programs, except adding a turbine at one of the other plants.

That can be done with the plant built and all the facilities—the machine facilities in—can be done by spending very much less money per unit than is required when we start a new plant.

Q. Did you point out that the ratio of physical property to gross revenues and net income has been increasing? A. I pointed out at certain points, but I have here figures that

indicated that in 1919 the ratio of physical property to gross

—1,089—

revenue was 3.35 and in 1939 the ratio of physical property to gross revenue had jumped to 4.84.

Q. What about the ratio of physical property to net income before interest? A. That has increased since 1919 by 14 per cent.

Q. Would it be possible, Mr. Crawford, for you to provide for your needed plant expansion out of your own earnings,
2189 such as I understand is possible with many industrial concerns? A. You mean that, if we were to forego dividends, would we have sufficient earnings to take care of plant expansion?

Q. Yes. A. Well, it wouldn't be true with our Company.

Q. Could you give us an example? A. Well, now—yes, I presume that into the Ford Motor Company has gone very little new capital than that provided by the business itself. In other words, after the first small initial investments, I am under the impression that that plant has grown to its present size by merely plowing back earnings.

2190 That just wouldn't work, couldn't be done in our Company; in the first place, with the regulated rates, we wouldn't have sufficient earnings. As an example that you have asked for, in the period of from 1922 to 1930 our plant investment

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increased \$87,400,000.00. Of that \$87,400.00, \$12,800,000.00 was provided by investment of depreciation reserves, leaving a balance required of \$74,600.000.00.

Now, if all common dividends had been foregone——

Q. (Interposing) Dividends or earnings? A. Well, if dividends had not been paid and all earnings available for

common had been applied to capital they would have amounted in that period to $47,600,000.00, which means that, even had no dividends been paid on the common, and every cent available for such dividends had been reinvested in the business, there still would have been lacking 27 million dollars.

Q. How does your turnover of money compare with other business—for example, with department stores? A. Well, as I just pointed out, our turnover is at the rate of about a fifth of our invested capital. 2192

Mr. Binford: That turnover is annual?

(Discussion off the record.)

By Mr. Browning:

Q. You mean by "turnover" the annual turnover? A. Well, as has been pointed out, we turn over our capital about once every five years. I think, for instance, department stores turn over their capital many times in one year—from 6 to 8 times in one year. News stands turn their capital

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over almost every day.

I think we are the slowest business in turnover that I know. In other words, we have to invest more dollars to get a dollar of revenue than any business I know of, and that has been increasing, of course, since—in the last twenty years.

Q. I believe you stated that the North American Company's acquisition of control of the Cleveland Company occurred in 1922 and you have pointed out also the earnings

that have remained in the business since that time, the improvement in your debt ratio, and your refundings.

Have you charged off any intangibles since 1922? A. We have made many charge-offs. We have charged off practically all intangibles other than a small amount of interest during construction. If you would like it in any detail, I can give it to you.

In 1927 we charged off $427,000.00, which was the cost of selling the 15 million dollars preferred stock back in 1923,
2195 which had been deferred on the books. We charged off the royalties, franchise and licenses that had been in the assets of the Company until way back in the Edison days, $673,000.00.

We charged off other intangible property, plants, at formation of the Company in 1892, total $608,000.00. We

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charged off miscellaneous intangibles assets of $224,000.00. We charged off the securities of the Avon Railway Company, $200,000.00, and we charged off advances made to another subsidiary, the Power Construction Company, for $550,-
2196 000.00. In 1935 we charged off practically all miscellaneous items that were left, leaving only federal and state taxes on securities now outstanding, a total of $37,461.00.

So that our books represent property charged way down with never a write-up. There has never been an asset written up on the books of the Illuminating Company.

Q. Has the Cleveland Company received any assistance in its financing from the North American Company and its staff? A. Well, I think it may have received a tremendous amount of such assistance. We have been required to finance large amounts and we have been required to do it time and

time again, and to be an expert in public utility financing requires not only special training but constant use of that training.

A financial expert must have a continuous acquaintance with financial markets. Not only must he know prices existing on securities as of today, but he has got to know details of the types of securities, their different, individual features. He must know the price trends existing and he must know the type of—he must keep in touch with the type of securities

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which will bring the best market, which investors and dealers will buy, and that requires years of training, and it is a field in which there aren't very many men well qualified. He must also know—someone must know, in providing the financing for a Company, the proper provisions and covenants and restrictions and what not that go into corporate mortgages.

There is a good deal of difference of opinion at all times, I think, as to what should go in a mortgage, both from the standpoint of the borrower and the standpoint of people who are supposed to lend the money under that mortgage. 2199

Such mortgages change. For instance, our present mortgage is a totally different instrument than the one that we financed in the earlier years of the Company. The restrictions are different; provisions are different; the covenants are different, and someone has got to keep in constant touch with the development of utility financing.

Then, again, it might be said that you can look to investment dealers for sufficient advice. We haven't found that to be true. The investment dealer——

Q. (Interposing) You mean by that the investment banker? A. Yes, the investment banker to whom we might sell securities.

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I was in the investment banking business myself at one time and I think it is perfectly true that the investment banker is like any other merchant. He wants to buy the kind of merchandise or stock that he thinks he can sell, and he wants to buy it at a price at which he thinks he can sell
2201 it and make the necessary profit or the desired profit. So we felt that we couldn't rely on the advice of any investment banker as to covenants, call prices, sinking fund provisions, or even prices and spreads—they have always been a matter of argument and discussion.

Q. On the technical side, is there a fundamental difference in approach between the investment banker and a company executive? A. Why, yes. As I tried to point out, the investment banker wants to impose as many restrictions as he can on the borrower for the protection of the lender.

On the other hand, the borrower, seeing an increasing
2202 requirement for capital funds, works in his negotiations with bankers for freedom of action—something that won't cripple him the next time he needs to provide capital.

Those things, when you have time to discuss these things —and you usually must take time—sometimes it would take a long time ironing out the point of view of a banker or group of bankers with that of the borrower.

Q. The security ultimately issued, then, is a compromise

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between the two points of view? A. It is bound to be a

 2203

compromise. Of course, it depends on market conditions somewhat. In a so-called buyers market the restrictions can be pretty severe. When a Company has to have money, when money isn't available or easy to get for that particular class, then the bankers can tighten up pretty strong on you, as they did on us around 1920. On the other hand, when there is a great deal of money for investment the borrower can, I think, with more success, endeavor to ease the restrictions which will give him more freedom without impairing the security.

Q. Is this conflict, which you are describing, a matter 2204
of lawyers' argument? A. No, I don't think it is. I think it is a matter of business judgment and discretion, rather than legal details.

Q. What about the paper work done in connection with these security issues? A. Of course that is perfectly tremendous, particularly since the Securities Exchange Act was enacted and the Public Utility Holding Company Act was enacted.

Q. There was some before then, wasn't there? A. Oh, there was always a good deal, but it has been multiplied in
the last few years, and it takes a lot of time and a lot of 2205
work by a lot of people.

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For instance, in this last financing that we were required to do, there were prepared a total of 98 documents covering one thousand five hundred fifty-seven pages. Then again time is a very important element. The Company wants money and it must be certain how to get it. Bankers are not willing—nor should they, I think, especially in times of stress—to carry long time commitments, and the result of

2206 that is there must be a pile of work condensed into the shortest possible time.

The work must be organized and finished within a rigid time schedule. Now, ever since The North American Company took control of the Cleveland Company—and that was about the time that our demands for capital became really great and pressing in that expansion period of the twenties —we have leaned on North American to do many of these things.

2207 We haven't kept on our staff a fiscal expert. The treasurer of our Company—as I pointed out in my testimony on the organization—has one assistant in treasury matters. To have had such a man as treasurer of the company would have meant charges, and the development of utility financing would have been a heavy expense to the Company.

Whether we could have even gotten one or not, I question, and if we had gotten him, whether he could, with the limited experience that he would have had in our company, the intervals between financing, if he could have kept abreast

2208 of the developments, I doubt very much.

All this time, since I came with the Company in '21, and since the North American assumed control in 1922, we have looked to Mr. Fogarty for that kind of assistance. He at that time was secretary of The North American Company, and I was secretary of The Cleveland Electric Illuminating Company, and he and I together—with he doing most of the thinking on it kept abreast of markets, banking, prices, the developments in indentures and what not, and of course he had a very wide experience, because while we would only finance this year and then possibly three years later, and

then again five years later, one or more of the constituent companies of The North American Company was doing financing nearly all the time, so that Mr. Fogarty was constantly abreast of financing requirements, and I think his help to us not only saved us a lot of money in having to provide a staff to do that sort of work, but I think his knowledge and experience and constant acquaintanceship with what was going on, served us in better stead than any man we could have hired to do it; even if we had hired Mr. Fogarty himself and put him out in Cleveland, he wouldn't 2210
have been as valuable to us, he couldn't have been as valuable to us as he was getting this constant contact and experience with banking markets year in and year out.

Q. That is, you could not give him the practice? A. No.

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He wouldn't have the experience or the contacts out in Cleveland. He has been in constant contact, not only with bankers but with big institutional buyers, and I think his whole work has been invaluable to us.

Q. Have you on your Cleveland staff an expert on the technical terms and provisions of corporate mortgages, and 2211
that sort of thing? A. No. And by the same token I don't think we could have had such a man. In thirty years we have only written two mortgages, and we just haven't felt that we required such a man or such a staff, knowing that we had at our right hand all the time the staff of The North American Company, not only Mr. Fogarty, but, as he was —he was secretary for the Company for many years, then he became vice president of it, and then he was succeeded as secretary by Mr. Piske,——

Q. P-i-s-k-e? A. P-i-s-k-e. —who had trained with Mr. Fogarty, had been his assistant all the time Fogarty was working on The North American financing and then when Mr. Fogarty was made president of North American in '34——

Q. (Interposing) '33? A. No. I think—was it in '33?

Mr. Browning: Off the record.

(Discussion off the record.)

2213 A. (Continuing) Well, then, Mr. Piske became vice president

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of the Company and Mr. Hartel, who had trained for years under Mr. Piske, took over the secretarial and financial details.

Mr. Hartel is now secretary of The North American Company. I don't think we could have mentioned in dollars the value that that help has been to the Illuminating Company in raising funds, and not only raising the funds but raising them in the right way, and at the right rates, and with indentures that are not too onerous, and that kept our financial
2214 structure in proper balance at all times—I just can't say too much about the help that I think we have gotten from the North American Company, particularly in those three men--Mr. Fogarty for a long time, then Mr. Fogarty and Mr. Piske, and then Mr. Fogarty and Mr. Piske and Mr. Hartel.

Q. Now, can you mention specific illustrations? A. Yes. We had, as I pointed out either in testimony or in one of these exhibits, we had an outstanding $800,000.00 of six per cent. preferred stock which had preemptive rights, and which

was non-callable. In 1923 we wanted to raise money by the sale of preferred stock, and we knew that we would have to have money from time to time, and we figured that a part of the capital retirements from time to time, as the Company grew, should be preferred stock. The Ohio law at that time didn't authorize serial preferred stock, but I had many consultations with Mr. Fogarty, both in New York and Cleve-

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land, on how we could do this job, and I may say that the solution of it, that the stock as it was authorized and as the 2216
amendments to the articles permitted, did enable us to, without having serial preferred stock, to keep selling from this issue as we did.

Then again in '24, we needed—in 1924 we came to a place where we could see large capital requirements. We had a mortgage written in 1939——

Q. 1939? A. 1909. (continuing)—limited to 30 million dollars, limited to one coupon rate and with burdensome call provisions. As I say, the limit of bonds to be issued under that mortgage was 30 million dollars, and we already had outstanding 18 million, five hundred thousand, so that 2217
there were only 11½ millions available under that mortgage.

It would have been burdensome to call those 18½ million first mortgage Fives. It was a question whether the market would have provided enough money at a proper price to retire them and give us the money we needed for expansion.

It was somewhat of a problem. We had to build a plant at Avon, which was going to take some 15 million dollars. There was much discussion as to how that was to be done. It was even possible it might be necessary to form a separate

corporation to build and own that plant and lease it to the

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Illuminating Company.

Mr. Fogarty, however, worked out a new general mortgage which solved our problem. In the first place, it was open end. It had no limitation as to the amount of bond that could be issued thereunder. It was much more liberal in its provisions and in order to raise 11½ million dollars, which we felt that we needed at that time, we took down the
2219 unissued 11½ million of first Fives of 1909 and placed them as collateral, together with a second lien on all the assets of the Company, and issued thereunder 11½ million of general mortgage Fives, and got the new mortgage executed and in operation.

That idea was entirely Mr. Fogarty's.

Q. Was that a new idea? A. It was entirely a new idea, as far as I know. I never heard of it being done before. To show the advantage of it, we were able two years later to issue another series. The first bonds we issued under that mortgage were Fives due in '54. That was in '24, and in
2220 1926 we issued ten million more of another series Fives due in 1961. I think we got a little premium for those bonds.

Q. Now, you say that he planned these operations? A. I would say that he not only planned them, but that he actually designed them.

Q. Did he also negotiate with bankers? A. He negoti-

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ated with the bankers—he fought with the bankers on the details of the bonds. He negotiated with the bankers, I would say, right down to the final determination of the amount of spread, and the price of issue, and then Mr. Lind-

say and I would go down and work out that last final detail
with Mr. Fogarty. He was always with us.

Mr. Browning: Off the record.

(Discussion off the record.)

By Mr. Browning:

Q. Now, what about the recapitalization of 1929? A. You
see, we had this 15 million odd of preferred stock issued in
'23, '24, and '25, outstanding, and it was always slightly 2222
under a cloud from the fact that there was another issue
ahead of it, of an uncallable preferred stock that was issued
back in 1892 and 1897, so the stock couldn't be called the
first preferred stock of The Cleveland Electric Illuminating
Company.

It was the six per cent. preferred stock authorized in
1923. We were very anxious to find a way to dispose and
eliminate that old $800,000.00. It didn't amount to much
in money, but it did throw a cloud upon our other securities
and we worked out a plan, for which I think it is only proper 2223
to say that Mr. Fogarty is largely responsible, of exchanging
that stock for common, and that was done in 1929. The stock
was retired, every share of it was converted by the holders

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into common shares, with the result that the six per cent.
preferred stock, authorized in 1923, automatically became a
first preferred stock, and I think our financial structure was
certainly benefited by the change. It brought us down into
having only three securities—mortgage debt, one issue of
preferred stock, and common stock.

Q. Did Mr. Fogarty work out a proposed refunding in 1933? A. In 1933 Mr. Fogarty, in consultation with me, went quite a long way toward refunding our Fives by placing a lower coupon rate bond directly with the insurance companies. He carried on negotiations with them and consultations with me for a number of months. It hadn't been done yet, but he thought it might be done.

Q. That is, it was a new idea then? A. It was new as far as any of us knew about. It was new to me, and I think
2225 new to everybody. I don't think there had been any private placements of anything like the size of that, with insurance companies.

Mr. Browning: Off the record.

(Discussion off the record.)

A. (Continuing) They got into some very hard trading and after pretty continued negotiations the matter was dropped just before we recommended that, in view of the restrictions, that the insurance companies were trying to place on the

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2226 mortgage, that we had better not do it, but there was a lot of work done on it and a lot of thinking, particularly by him.

Q. During that period, were you in communication with Mr. Fogarty? A. Well, I have always been in constant communication with Mr. Fogarty, and at that period, when those negotiations were going on, we were just in constant communication, either by my going to New York, or by telephone, or by letter.

Q. What about your 1935 bond financing? A. Well, as you know we had 40 million dollars of five per cent. bonds

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outstanding, under the general mortgage which became a—automatically became a first mortgage with its retirement.

Q. With what? A. With the retirement of the collateral, which was effected by the retirement of this 1935 financing. Five per cent. seemed like pretty cheap money back twenty years ago, but it looked a little dear in 1935, so Mr. Fogarty and I watched the market, checked the market, when we were able to retire all of those first mortgage bonds, and general mortgage bonds, and bring out an issue of 3¾ under a new mortgage. 2228

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Q. Was that a difficult operation at the time? A. Well, I think it was difficult at the time. I think it required a lot of work. I know that Fogarty and I worked continuously on it for a considerable period of time before we succeeded in doing it. The deal went over very well. We received a hundred and a half for the bond which was a very favorable price at that time. Mr. Fogarty handled all necessary negotiations with the bankers except getting down to the final trading for a half point when I stepped in and reinforced him somewhat. That was a very much better mortgage than 2229 the mortgage we had. It gave us, among other things—we were in a better period to do financing than we had been before. They learned how to write better mortgages, I think, and a so much more liberal mortgage and a very satisfactory piece of financing.

Then again in 1935 we made a reorganization of the stock of the company and sold four and a half per cent. preferred stock to retire the outstanding six per cent. stock, reducing our preferred stock dividend charges. That was done, of

course—Mr. Fogarty and I were working constantly on all these things.

Q. This was a clear-cut serial preferred stock? A. Clear-cut serial preferred stock.

Q. Had Mr. Fogarty had experience with that in other dealings? A. Yes, he had had—He had done that in other

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North American Companies, certainly in Union Electric of Missouri, and I don't know but possibly other ones, but he
2231 had had experience with that type of preferred stock.

Q. Now, let's take the most recent illustration, your 1940 financing. Will you tell us about that as an example? A. Well, of course we had had these forty millions of three and three-quarters which were listed on the New York Stock Exchange, had been selling substantially above their call prices, other companies were doing refunding. We were very anxious to refund these bonds. Unfortunately, however, back in the fall of '38 we got into a very extended rate controversy with the city council of the city of Cleveland. The
2232 rates that we would be able to charge in the future were uncertain and we felt that we would have been greatly penalized to have tried to bring out a bond issue and get the money rate that we ought to get until we had that rate controversy settled.

Of course we were hopeful all the time that we might be able to bring about a settlement, but the controversy got more extended and more bitter and finally the council passed an ordinance which we felt was unfair and unreasonable and we couldn't accept, and we appealed to the Public Utilities Commission and the controversy had a good deal of publicity,

and we felt certainly that until that matter was settled, it

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wouldn't be possible to refund our old bonds and get some new money which we could see that we needed, at the best possible price.

I was very busy in this rate case. I had charge, of course, of the necessary negotiations with the council on behalf of the company. We had to employ engineers to make engineering studies and to supervise an inventory and appraisal, and the thing went on and on and on. Then, too, we were engaged 2234
in the designing of this new plant. That took a good deal of my time and consideration.

Q. Had the war disturbed you? A. The war overhanging us, which we didn't know but would break the market almost any minute. So, as a matter of fact, the possibility of refunding and refinancing just seemed out of the question. We got the rate matter settled early in June.

Q. 1940? A. Of this year, or possibly the last week in May. By compromise, the City Council passed an ordinance establishing rates for four years which we accepted. It was a compromise offer in our part which they accepted. Con- 2235
sequently, the litigation was settled and the case withdrawn.

I had not thought about any new financing and Mr. Fogarty called me up along the latter part of June.

Q. Will you give us the exact date on that. I think

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it is interesting. A. Well, it was on the morning of June 19 that Mr. Fogarty called me and he said that if we could get the necessary papers filed before the end of June, we could do the refunding necessary to retire the three and three quarters and provide us with ten million dollars of new money

without incurring the time and the expense and the delay of a new audit, that 1939 closing figures could be used as the basis for registration statements and other required documents. He said he had consulted with bankers and counsel in North American and felt that it could be done within that length of time and it did not seem to me possible. He thought —Mr. Fogarty thought that by working day and night—which was done—and by adapting, by making some changes that could be made in the existing mortgage that this could
2237 be done. Of course I gave the word to go ahead because there was nothing that I wanted any more than to get those three and three-quarters paid off, and some lower rate bonds, and then I wanted ten million dollars of new money to provide this plant expansion. I don't know how they did it but that outfit down on 60 Broadway, The North American Company, together with counsel, did, I think, a super-human job and it just couldn't have been done by us, ourselves.

At any rate, it was done and we got filed down here in the S. E. C. in time to make an offering on Friday, July 19—

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2238 we just worked like thunder to get that off on Friday the 19th because we were afraid to let it go over the next week on account of this possibility of an invasion of England or something that would break the market.

Well, we were very fortunate. We got a good price for the bonds. We got ten million dollars for plant expansion, and we were all very happy about it.

Q. Will the Cleveland Company have financing problems in the future? A. I should think that is almost certain. As you know and has been testified here, our investments grew from thirty-two million property account in 1920 to one hun-

dred and twenty million dollars in 1930. That required an average investment of $8,800,000 a year. We found ourselves, of course, when the depression started, with more plant than we needed and, as I have testified, our problem was not so much to build more plant as it was to keep the plant we had busy.

In 1939, however, our business was back at a record-breaking volume. We sold more kilowatt hours than we ever sold before. And then, of course, preparation for demands
that might be put upon us for war preparation has required 2240
us to make a very heavy plant investment. Our business is increasing very rapidly, and of course for every million dollars of increased revenue we must find five million dollars of capital to take care of it.

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If our growth in the next five years would require an increased plant capacity of 100,000 kilowatt hours, it would mean an investment of 10 million dollars in generating facilities alone, assuming that generating facilities can be built for a hundred dollars per kilowatt.

Of course, for every dollar we invest in generating plants 2241
we have to invest from two to three dollars in transmission, distribution and utilization, so that we are going to have, if business continues to grow, a requirement of a lot of money every year for plant expansion.

I don't mean that we'll get the money every year but we will be spending large amounts for plant expansion every year, and our budget for 1940 is about ten million dollars. Our budget for '41, while it is not completed yet, will run at least that much and possibly a trifle more. We don't know what the industrial growth of our section will be. We

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are optimistic about it. We have room for industrial development and it doesn't seem to me that it is unlikely that our plant investment will grow at the rate of ten million dollars a year in the next ten years.

What we call the Eastern Division, which I think Mr. Lindseth described, that territory lying to the east of the Chagrin River and which is operated separately in many respects from the Cleveland Division, was acquired with the thought that it was an excellent area for future industrial

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development.

It has the same freight rates that Cleveland has; it has the same or practically the same railroad transportation; it has access to harbors for lake transportation. The Cleveland—the city area for heavy industrial use is pretty well taken up. Taxes out to the east are very much lower than they are in the city and, as a matter of fact we look for—the trend of industrial development has been to the east from Cleveland, and we look forward to a very active industrial development, in what we call the eastern division. As a mat-

2244 ter of fact, we are already in contact with three large prospective power users to be located in that district. Each one of these will use from 20 to 35 thousand kilowatts, if we are successful in getting them, and it will mean that a very substantial plant expansion will be required.

Of course, as has been stated, we must estimate in advance any demands that we are to be able to take care of. A factory using a large amount of power may be built in 6 months, but we can't provide power for them in six months. It may take us a year and a half to two years to do it.

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So we must keep ahead of any possible demand, and we must provide the funds to do that, and then, of the many millions of new capital that will be required if this expansion as hoped for does take place, a large proportion of it must come from equity capital.

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Since 1930 there has been little or no equity capital raised in the utility business; it has all been done by borrowing.

We have always managed, we think, to keep our financial 2246
structure in good balance, and if we continue to do that, as we must, it means that junior capital has got to go into this company.

Q. Don't you think it is a little better than good balance, Mr. Crawford? A. What?

Q. Are you proud of it? A. I prefer to have someone else say that. We are very proud of it, off the record. The North American Company has put into the Illuminating Company in the last 20 years over 4[illegible] million dollars of equity capital. In the next 20 years somebody must provide, I think, an even 2247
greater amount. The North American Company, with its investment already made in Cleveland, with its knowledge of the management, with its satisfactory experience over a long time in that Company, seems to me is the logical source for us to look for this equity capital.

I have testified also to the help and assistance that has been given us by the executives of the North American Company.

If we were to be deprived of this help, we would certainly

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be put to great expense. We would have to hire people that we do not now hire, and I question, as I said before, whether we could hire and retain the expert advice and help and assistance we have had from the executives of The North American Company.

I feel certain that, if we were dissociated from The North American Company, that the result would be substantially increased financing costs.

Q. Mr. Crawford, do you consider it possible to secure
2249 the necessary capital for the Cleveland Company in Cleveland? A. I think that would be entirely out of the question. I don't think there is sufficient—nor has there been sufficient investment capital in Cleveland to have provided the equity capital that we required in the past.

I don't know of any issue—certainly no utility issue—that has ever been issued in Ohio—take not only Cleveland but Ohio—that required the amount of cash that had to be put into this Company by somebody as equity capital.

As a matter of fact, I question very much whether, even if the money were available, Cleveland investors would have
2250 put up the money we have needed in the past, or that we will need in the future.

They are too close to the situation. They know we have—they are fully aware, from time to time, that we have municipal competition. The newspapers keep them advised of that quite frequently. I just feel certain that Cleveland

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couldn't have provided the capital required to take care of the growth of this property and——

Q. (Interposing) What about this theory that has been advanced of local patriotism? Have you found any local

patriotism in Cleveland? A. No, sir, I never saw very many patriotic dollars any place. They are not at all sentimental, dollars aren't, and well, as a matter of fact, in this 50 million dollar bond issue that we have just sold, I used all the influence I could bring to bear to get the Cleveland dealers as large a participation in that 50 million as I could, or as they wanted, and they were very happy and well satisfied when we got them 2½ million dollars out of the fifty.

Q. Was all that placed in Cleveland? A. No, that was placed in the territory served by Cleveland bond dealers and 2252 investment bankers.

Q. So that not even all of the 2½ million dollars was placed in Cleveland? A. No. Cleveland, as you know, was pretty hard hit back in the early thirties, not only by failures of railroad financiers, but also with two very severe bank failures; two of the three largest banks closed up and Cleveland funds have been scarce for any kind of investment since that time, and then particularly, I think, Cleveland local capital has been interested more in industrials, steel

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business and motor car business, and lake transportation, 2253 iron ore, coal, and that sort of thing, than in any other type of investment, so that I can state without qualification that Cleveland could not have financed the growth of this Company.

Q. You mean that the Cleveland investor would be more interested in industrials with larger profit possibilities? A. More speculative, more chance of making money. That is just the kind of town Cleveland is.

The Examiner: Let us have a short recess.

(Whereupon a short recess was taken.)

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By Mr. Browning:

Q. Have investors been unable to obtain the information necessary to appraise the financial position or earning power of The Cleveland Company because of the absence of uniform standard accounts? A. No. Since 1911 this Company has continuously used the Uniform Classification of Accounts of the Public Utilities Commission of Ohio. The Public Utilities Commission annual reports are available for public inspection. We have published annual reports to stockholders
2255 every year since 1918. We make quarterly reports to financial publications and financial services such as Moody's and Poor's Standard Statistics, Wall Street Journal and Standard Stock Exchange.

We make reports frequently to the Federal Power Commission, voluntary reports, and to the S. E. C., and the Public Utilities Commission Classification of Accounts is the basis for all these reports.

Q. Are your securities issued without the approval or consent of a governmental body of the State of Ohio? A. All of our securities are subject to the consent by the Pub-
2256 lic Utilities Commission. It requires written application on our part, a public hearing by them, and an order signed by the Commission.

Q. Has The Cleveland Company issued securities upon the basis of fictitious or unsound asset values having no fair relation to the sums invested in or the earning capacity of

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the properties? A. Well, there have been no such security issues. There have been no paper profits in inter-company transactions and very few inter-company transactions of any

kind, and such transactions have always been at cost. Hence, no such securities have been issued on either such basis.

Q. Have you issued any securities under circumstances which have subjected you to the burden of supporting an over-capitalized structure and which have prevented you from making voluntary rate reductions? A. I think quite the reverse is true. Our total capitalization is only 83 per cent. of our $145,000,000 property value. Interest charges are 3 per cent. on $50,000,000 of bonds and 4.5 per cent. dividends on $25,500,000 of preferred stock. 2258

There have been no loans made either to the North American Company or no borrowings from the North American Company. We made seven voluntary rate reductions in the past 16 years. The average revenue per kilowatt hour residential has declined from 5.06 cents in 1924 to 3.58 cents in 1939, and a very substantial rate reduction was just made effective in 1940 which will still further reduce that revenue.

Q. Do you know whether there has been any lack of economy in the raising of capital in the Cleveland Company? A. There has been no such lack of economy.

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Q. Mr. Crawford, where is the final authority in the management of the Cleveland Company? A. The final authority of management in the Cleveland Company is in the board of directors.

Q. Is there an executive committee? A. Yes, there is an executive committee of three members of the board. The board has seven members. The executive committee is composed of three of those seven members and has consisted since I have been president of the Company, of Mr. Fogarty, Mr.

H. C. Freeman, a director and vice president of North American Company, and myself.

Q. What are the functions and duties of the board of directors? A. Well, the board of directors, I think, does what most such boards usually do; specifically it elects the officers of the company, fixes the compensation, selects the executive committee, declares dividends, approves construction and operating budgets, authorizes financing and the issue of securities, authorizes the president to act in matters
2261 such as rate reductions. It authorizes payments to the trustees of the Employees' Fund. It acts on all formal matters.

Q. And it is generally in charge of the management of the business? A. Very actively so.

Q. What has been the composition of your board of directors? A. Well, for more than 20 years we have had, out of a

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board of seven, three members resident in Cleveland, a fourth one in Cincinnati, and three outside the state. For more than 30 years at least two representatives of the Company's staff on the board have been resident in Cleveland. At the
2262 present those two would be Mr. Frank Cobb, and myself.

For the same 30 years one representative has been a resident in Cleveland whose interests are not specifically utilities. That particular representative is Harold T. Clark. Such an arrangement on a board of seven makes for a desirable balance between representatives of the local management and the local community, the controlling stock ownership, the minority ownership, and generally broad business viewpoints.

Q. You say that there are seven directors of the Company? A. Yes.

Q. Of whom you are one? A. Of whom I am one.

Q. Will you tell us who the other six directors are? A. Frank M. Cobb, who is our general counsel, a lifelong resident of Cleveland, has been a director practically all the time for the last 28 years. He has been associated with the Company since 1902 and has been full-time office counsel since 1914. He was made general counsel of the Company in 1924 Mr. Cobb is certainly one of the best informed lawyers in Ohio on public utility law. He has practiced before the Commission for our Company since the Commission was formed 2264

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in 1911, and he was a member of the faculty of Western Reserve Law School for many years. He is a man of means and substance in the community and very highly regarded.

Harold T. Clark, who has been a director with the exception of a very short interval since 1922, was for many years a senior partner in the firm of Squire, Sanders and Dempsey. This firm is one of the leading law firms in Ohio. However, in 1938 Mr. Clark retired from Squire, Sanders and Dempsey and opened his own office. He has remained on our board, of course. He is a very important man in civic affairs 2265
in Cleveland. He is a man of means and has taken large interest in public affairs.

He is president of the Cleveland Museum of Natural History. He is a member of the Regional Association of Cleveland. He is very active in the Cleveland Association for the Blind, and the Cleveland Museum of Art, the Western Reserve Historical Society, and many other civic affairs.

William H. Fillmore. Mr. Fillmore has been a member of our board since 1913 and lives in Cincinnati. He is an investment banker in Cincinnati and has represented, I would

say, the minority interest in the voting stock all that time. He is a very cooperative director. He is very constant in his attendance. I don't think—I can't remember his ever being absent from a meeting of the board since I have been associated with the Company, and he corresponds with me continually and frequently about the affairs of the Company. He

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has been an excellent director.

Another member is James F. Fogarty, chairman of the
2267 Finance and Executive Committee of the North American Company. He has been employed by the North American Company since he was a boy, more than 38 years. He has been a director of our Company since 1933. He is also a member of the executive committee.

H. C. Freeman, a member of the board since 1934, is vice president of the North American Company. He is a former member of the accounting firm of Touche, Niven and Company. He is an accountant of the highest ability. He has been a member of the executive committee of our Company since his election to the board in 1934.

2268 The seventh member is Mr. Frederick H. Piske. He is a vice president of the North American Company and has been an officer of that company for many years. He was elected to the board May 1, 1939, and has not been able to attend many meetings. He has been quite seriously ill for many months, although he is improved and I think will probably be able to take an active place on the board from now on. Before his election to the board, as I have stated, he was a great help to us in financial and corporate matters.

Q. Has there been any dissension within the board of your Company during the last 20 years, or since the period of

North American control? A. There has been no dissension of

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any character. I don't know of any action that has been taken by the board since 1922 in which there has not been unanimous affirmative vote by all members present. There has been no dissension or difference of opinion of any kind. There have been discussions between me and members of the board both prior to and following board meetings, but in the board meetings we have never had any disagreement, within the board, and it has made my lot, since I have been running 2270 the Company, very happy when compared with the executives of a different kind of a board. We have had one or two instances in Cleveland where companies have had difficulties, I think largely because of the fact that the board was composed of—the boards were not harmonious.

In our Company there has been no such thing as that. The relationship has been perfect.

Q. Is this harmony in the board of directors important in the business of the Company? A. I don't know how anybody could run a business without it. To me it is essential. I think it is most important. 2271

Q. You mentioned the executive committee. What is the function of that committee? A. The executive committee enables the president and the management to consult with the board or representatives of the board from time to time between directors' meetings. The executive committee has been given very broad powers by the board, in fact its powers

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enable it to do anything the board might do except to elect senior officers of the Company. I, as president of the Com-

pany, am in constant contact with the other two members of the executive committee.

Q. With Messrs. Fogarty and Freeman? A. Yes. I go to New York very frequently to consult with them informally and several times a year, probably, we take formal action on certain matters and when that is done minutes of the meeting are kept and submitted to the board of directors at its next meeting and approved and ratified by the board. The board meets quarterly ordinarily, usually in Cleveland,
2273 practically altogether in Cleveland except at such a time as this recent financing when we had to get all the board members at one place at one hour and get things signed down in Washington by aeroplane in order to meet a time schedule. Nearly all of the meetings are in Cleveland and the meetings of the board are very faithful in attending.

Q. How many presidents of the Cleveland Company have there been since 1922? A. Only two, Mr. Robert Lindsay was president from 1921 to 1933, and myself from 1933 to date.

Mr. Lindsay came to Cleveland in 1893 to superintend the building of the Canal Road plant of the Company at that
2274 time. When that plant was completed he was employed as general superintendent and from that time until the time of his death, or until shortly before his death, he was the active

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manager of the operations of the Company, that is the production and distribution of the Company's product. He was made vice president and general manager in 1914 and president and general manager in 1921, and under his administration the assets grew from $42,000,000 to $128,000,000.

Q. Now, will you describe for us your own functions as president of the Company? A. Well, I would say that my

functions are many and diverse. Taking them in some kind of order, I determine the personnel of the Company, that is the supervisory personnel. I assign that personnel to its duties, its responsibilities. I make promotions. I determine salaries. I assign department heads and officers to special duties when special occasions arise.

With respect to salaries we have a wage committee consisting of Mr. Hough, Mr. Kermode and Mr. Ober, who pass on salary or wage increases where the salary involved was less than $4,000 a year. On salaries over $4,000 a year, except 2276
the officers of the Company, I determine such salaries and make increases on recommendations after hearing recommendations from Mr. Hough or Mr. Ober, or Mr. Gillie, Vice President in Charge of Sales.

For example, take Mr. Lindseth. Mr. Lindseth was for a number of years an engineer out at our 70th Street plant, in charge of a group of testing engineers. A few years ago I wanted a special survey made of the sales department and I selected him to do that work. I was so favorably impressed

with what he did at that time, that I attached him to my 2277
office and when this rate case matter came up I not only put Mr. Lindseth in charge of the details of the rate case and of the inventory and appraisal made necessary by the rate case, but in consultation with him I detached from the regular operating staff certain members that we felt could be spared and could do the work properly and assigned them to him for that purpose. That is just an example of my action with respect to personnel.

From the publicity standpoint, the publicity of the Company is handled by Frank J. Ryan who is Assistant to the President. I spend a lot of time and a lot of thought with

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Mr. Ryan on publicity matters, on how much money may be appropriated for pubilicity purposes in a year, in other words the budget for publicity, and how that money shall be spent as between newspaper advertising or mail advertising, or bill boards, or in what media it will be placed. As I have said in my previous testimony, for the past—since 1933 load building has been our biggest job and consequently I have spent a great deal of time with the advertising department.

The same is true with sales promotion. That is in charge,
2279 as I said, of Mr. H. C. Gillie, Vice President in Charge of Sales. I think I have spent more time in the last seven years, barring rate cases and hearings, with the Sales Department of the Company than any other way. We spend a lot of money in sales promotion. The sales promotion budget runs between 2 and 3 per cent. of our gross revenues and that

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money can be spent wisely or unwisely and I have devoted a lot of my time to this sales department for the past six or seven years.

Q. In addition to supervising the work of sales promo-
2280 tion, do you do a little selling, yourself, Mr. Crawford? A. Why, I sell all the time, I think. I try to. I don't let any opportunity to sell go by. If I am out for dinner in the evening I try to sell my host an electric range to have it installed before he invites me the next time. I think that I sell all the time, Mr. Browning. I am awfully keen on that part of the business. I have been successful myself in getting some very large accounts for the Company by constant cultivation and sales work with the executives of those companies.

(Discussion off the record.)

Q. What about the purchasing policy of the Company, Mr. Crawford? A. Of course, that is a big job and it is something that involves a lot of money, with construction budgets running from three or four million a year up to ten million dollars a year, and I devote a great deal of my time to it.

I hold frequent meetings with my associates. We watch pretty carefully the price trends and I try to save as much money for the Company as I can in the buying of materials and supplies. For instance, at the outbreak of the war we determined that copper would probably go up if there were 2282
a war and we bought a year's supply of copper for a little less

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than ten cents a pound. We had the money and I felt that it might go up very substantially. I decided that we would buy a year's supply of copper and we got it under ten cents a pound. It did go up but it softened and we have not saved as much money as I thought we might, although we are protected on it.

The same thing is true with fuel. I have interested myself in fuel buying a good deal. While we have a very skillful fuel buyer, the fuel expense of the Company is one of 2283
the three or four large items of operating expense and we have maintained under my direction a very substantial inventory of coal for several years. In the first place we have ample storage facilities. We are able, with those storage facilities, to buy when the market is soft and having an ample supply of coal we are able to drop out of the market temporarily when prices stiffen, and as most of our coal burning is slack and as slack is apt to be the bottleneck in the output of the mine, by being able to store slack—and we

have been doing that very successfully, Mr. Maxwell—we can pretty well keep the price of fuel within range.

We have at present about 500,000 tons of coal in storage, which is about five months' supply, and we consume about 25,000 tons a week in the summertime and most of our coal is not put in storage at all. A trainload of coal a day is what we burn, practically. So, I take a great interest in that item of expense.

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2285 Then again in the purchasing of the equipment to go into a new plant I am the final authority in the Company on where that will be bought.

Q. You mean where it will be placed? A. Where the order will be placed, where we will get the equipment.

Q. Oh, I see; the equipment. A. Yes. I have to take an interest in that because we have a lot of customers who supply things that are required by us in the construction of a new power plant and we have to maintain some sort of a balance of reciprocity.

In the first place it has been a Company policy for many
2286 years never to buy anything outside of Cleveland that we can buy in Cleveland, all other things being equal. We think it is more important to keep our dollars in Cleveland than to send them any place else. So in purchasing I spend a great deal of time on that.

Then, of course, one of the things we have to do, we have 80 municipalities with whom we do business. I keep many contacts with the governments of the larger of those municipalities. I know the mayor of Cleveland very well, the mayor of Cleveland Heights, the mayor of Shaker Heights, the mayor of Lakewood, and I run into them and talk over the

mutual problems and I don't know that it is a result of that but the fact is that we have practically no trouble and have had no litigation with any of the communities we have

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served until this controversy started in 1938. Now, I think part of our ability to settle that controversy was the acquaintanceship that I had with the government.

In the City of Cleveland there has been controversy with one or another of the utilities for years. It had a fight with the Gas Company for several years and is having a frightful 2288
time with the Street Railway Company, in litigation for years. I think our ability to get this last rate matter settled was influenced in some degree by personal acquaintanceship and contacts I have made with members of the government.

Also, the newspapers. I know the editors of the three newspapers. I have made them close personal friends of mine. I see a lot of them. They talk with me about Cleveland problems and I talk with them about our problems. I think that has been very valuable. Of course, I keep in contact with the Public Utilities Commission. If I am in Columbus I will drop in and speak to the Commissioners and I go 2289
to all the hearings on rate ordinance matters and I represent the Company in applications for authority to issue bonds and I think generally our Company could not be on better terms with the Public Utilities Commission of Ohio. We have gone out of our way always to do everything they ask us to and I think the relationship has been a very fine one.

Q. Do you give attention to employee relations? A. I give a great deal of attention to employee relations because I am very much interested in employees. We have about

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3,700 of them. As I said before, we have never had any trouble in arranging working conditions or wage levels, or anything. We give a great deal of thought and time to wages and working conditions and to my mind having a proper employee morale and a proper attitude on the part of a large body of employees to the Company, is the finest instrumentality there is for maintaining fine public relations.

You see, we have, as I say, about 3,700 employees and they are scattered all over the territory that we serve. They have
2291 friends, relatives and contacts—a lot of contacts,—and I don't see how you could have proper public relations without having proper employee relations, so I like the men who work for our Company and I am sure they like me.

I mix with them a lot. I am beaten by them at golf and ping pong when I used to play ping pong, and there isn't a man in the Company who feels any embarrassment about coming up to see me about anything he wants to see me about. It is known that he has a welcome in my office so I think it may be said that I devote a great deal of time and attention to employee relations.

2292 I figured out that card and ping pong room for them and at least once every winter I go down there and play bridge for an evening or ping pong for part of an evening. I have played in their golf tournaments and been well beaten by some of them, and they are a great crowd of people. I think there is no finer organization anywhere than the people who work for The Cleveland Electric Illuminating Company.

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Q. You have also stated that you have necessarily given attention to the financing problems. A. Yes, I think I have stated that at great length.

Q. What about the collection policies, Mr. Crawford? A. Well, that is a very important matter. We have gone through a major depression and we have had a lot of delinquent accounts both individuals, businesses and municipalities.

Our greatest problem has been the delinquency in street lighting accounts and I have had to devote a lot of time to that and it is still a very important problem. We have brought down our delinquencies very markedly since they
reached their peak in 1933 and I think we have a very good 2294
collection record, I mean a record of losses. It runs about .2 of 1 per cent. in a normal year. It got to be over .3 of 1 per cent. in 1932 and 1933, but since conditions have improved we have brought that down to something under .2 of 1 per cent.

Q. Do you participate in matters of major engineering decisions? A. Yes, I do participate very extensively in them. I am not an engineer. I know little or nothing about engineering, but I think I know a good deal about some engineers. I preside at engineering conferences on determining the type,
size and location and capacity of additions, the locations 2295
for building new plants, and we have quite some differences of opinion among the engineers in our Company as to the

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pressure or temperatures that are to be used in a power plant and I let the boys talk it out and if I can't bring them into accord on it, I take the bull by the horns and decide what it will be, even though I am not an engineer, but it requires a good deal of time.

Q. Do you personally examine operating reports? A. Oh, continually. I have operating reports in minute detail pro-

vided continually and the operating men know that I get these reports and I am watching continually, not only in our own Company but the comparative statistics we get from other companies.

Q. From what other companies? A. From other companies in the—well, on station operation we get monthly comparative statistics from St. Louis, Milwaukee, Detroit and Washington, comparing the economies achieved at the plants, the wages, the cost of the switchboard, and our fel-
2297 lows, of course, know that I get these reports and every once in a while I will mention that I noticed by our last month's report that Ashtabula was not doing quite as well as Lakeside at Milwaukee and they are very valuable and I devote a good deal of attention to them.

Of course, on all major expenditures such as plants and that sort of thing, I discuss with the board. While the board has never put any limitation upon my authority, I am anxious that the board should share the responsibility with me, so that I have frequent discussions with the board on major

2298 engineering matters and very frequent consultations, of course, with the operating engineering staff.

Q. Do you give attention to banking connections? A. Why, I give about all the attention to banking connections that is given. As I have pointed out, we haven't needed to have a highly trained financial expert on our staff and I have, since I have been with the Company as secretary, kept the banking contacts for the Company.

The treasurer of the Company each day, each morning, hands me a list showing the amount of money in each of the banks in which we deposit. We maintain nearly all of our

bank deposits in our own territory, both in Cleveland and in the smaller communities we serve, and I determine in all cases how those amounts will be distributed among these different banks, so that I think that it may be said that I take over many of the duties that would ordinarily be handled by the treasurer of a company.

I have been on the National City Bank of Cleveland board since 1933 and on that board are the heads of many of our largest businesses in Cleveland. The weekly meetings which
I attend there keep me in constant contact with those buyers 2300
of large power and it has enabled me to get closer to them and for them to get closer to me. I think it has been a very satisfactory relationship and very beneficial to the Company.

Q. You have participated in civic activities? A. Yes, I

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think it may be said that I have participated pretty widely in civic activities. You see, we are the largest industrial unit in Cleveland. We have the biggest investment of any corporation in Cleveland. We pay the most taxes of any corpora-
tion in Cleveland, and I think the head of that Company 2301
should take participation in civic activities, and so I have been very glad to do it. I have been active in the Chamber of Commerce. I was chairman of the depositors committee of the closed Union Trust Company for five years and held frequent meetings and conferences on the solution of that problem.

In 1936 I was president of the Great Lakes Exposition and devoted about half of my time to it and all of the time of one of my assistants. It was a good thing for Cleveland. It brought me into contact with a lot of right people in

Cleveland and as I say, while it was hard work, I think I derived some benefits from it and I feel sure that the Company did.

I have been trustee of Cleveland College for a number of years. It does not take very much of my time but Cleveland College is a branch of the Western Reserve University which is downtown in the center of Cleveland and has day and night school for people employed in businesses down town. It has several thousand students and it is a very
2303 worthwhile cause.

I think those participations—as a matter of fact, I have just been persuaded to take over the raising of funds for the annual Community Fund this fall from the utility companies. I am supposed to go out and not only squeeze all

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the companies for what I can, but get the employees to contribute as liberally as possible. That means practically devoting one week of my time to that job, which takes place the last week in November, and [illegible]s a terrible burden. I have avoided it up to this year, but I yielded this year, so
2304 I will have that to do this year.

Mr. Browning: I think we have reached a convenient stopping point, Mr. Examiner.

The Examiner: All right. We will recess now until ten o'clock tomorrow morning.

(Whereupon, at 4:20 o'clock p. m., the hearing was adjourned to reconvene at 10:00 o'clock the following morning.)

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BEFORE THE 2305

SECURITIES AND EXCHANGE COMMISSION

File No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.* 2306

Hearing Room 1101,
Securities and Exchange Commission Building,
Friday, August 16, 1940,
Washington, D. C.

Met, pursuant to recess, at 10 o'clock a. m. 2307

Before:

W. W. SWIFT, *Trial Examiner.*

Appearances:

(As heretofore noted.)

PROCEEDINGS

The Examiner: The hearing will come to order.

Whereupon, EBEN G. CRAWFORD resumed the witness stand and testified further as follows:

Direct Examination by Mr. Browning (Continued):

Q. Is The North American Company of aid to you in
2309 handling your management problems, Mr. Crawford? A. The members of the staff, the executives of North American Company, are of almost inestimable help to me in management problems.

Q. Will you give us some examples? A. I think I have testified as to the help Mr. Fogarty has been to me in matters of financing through his experience and acquaintance with the subject.

Mr. Freeman, who is vice president of The North American Company and a member of our executive committee, and is a member of our board, of course, has been a great help in
2310 many ways. Mr. Freeman, before joining The North American Company, was a member of the accounting firm of Touche, Niven and Company, and enjoyed a very high repute as an accountant. His knowledge of accountancy has been available to us and has been of great use to us in the operation of the company. His knowledge of the Federal tax laws has been a great help to us in handling tax matters, so great

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that we have never felt any need for retaining any outside tax consultants of any sort.

In preparing our annual reports to stockholders we have really given Mr. Freeman the last going-over of the report as to style, form and contents. We count largely on his help in that respect. In the preparation of official communications in our negotiations with the City of Cleveland, for instance, on rate matters, Mr. Freeman has been of great help to us and has spent days in Cleveland in some cases working on that sort of thing.

Mr. Shea, president of The North American Company; I have known Mr. Shea for about a year but I have been in 2312
constant contact with him and he, particularly, has been of great aid to me because Mr. Shea's experience in business other than the utility business has been largely in selling experience in a highly competitive business. Mr. Shea formerly was in the oil business and he has advanced ideas on sales methods and business promotion.

Of course, as I have testified, that is the phase of our business in which I think I am possibly the most vitally interested, so the contacts that I have had with Mr. Shea have been many, both in New York and Cleveland. They have added a great deal, I think, to our ability to move our product 2313
and will do so more in the future.

I would say that Mr. Shea's ideas on sales promotion, on budget control, on internal auditing put into effect since his

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coming to The North American Company have been of great value and are of great value, and will be of still greater value as time goes on.

I have testified, I think, about Mr. Piske, vice president of The North American Company. At times of getting out

security issues Mr. Piske, since Mr. Fogarty was advanced to the presidency of The North American Company in '34, has been generalissimo in getting out the necessary documents in financing operations.

As you know those things are done at high speed to meet a very exacting time limit and I know of no one—I have seen no one who can carry on such matters with such speed and accuracy and exactness as Mr. Piske has been able to do. His help has been invaluable to us.

2315 That might be said to be true of Mr. Hartel, too, secretary of The North American Company, who, while he has no connection with our company has always pitched in and worked day and night on these matters where speed was important.

Then, Mr. Ed Thierry is an assistant to the president of The North American Company, a writer and an ex-newspaper man. He has been a great help to Mr. Ryan and myself, Mr. Ryan being my assistant in charge of publicity and the preparation and editing of sales matter, mailing sales matter, and also in the preparation of annual reports, put-
2316 ting the finishing touches on and making them readable and interesting, and we have had a great deal of use for Mr. Thierry's time. He comes to Cleveland now and then and

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sits down with Mr. Ryan and me and discusses our publicity and brings to us knowledge of the publicity methods of the other companies in The North American System.

Mr. Robert Sealy, treasurer of The North American Company, has been of help to us on a number of occasions. He has been treasurer of The North American Company all through the period in which The North American Company

has held control of our company and at times when we have financed and been in receipt of large amounts of money which we were not spending immediately Mr. Sealy has, on a number of occasions, assisted in our getting that money invested temporarily, either in short-time paper or in interest-bearing savings accounts with New York banks.

Of course, those days are over for the time being when you can get interest on money but there was a time when you could get very substantial return on funds which were
not required to be used for months or possibly a year or 2318
two. So, I think that Mr. Sealy can be said to have been really of great help to us in providing the place to put money out where it would earn a little something.

Mr. F. W. Doolittle was a vice president of The North American Company and an engineer for many years. I think he no longer has that title. I think he gave up his official position in New York two or three years ago on account of his health, but has devoted part of his time and most of his time, I think, to consulting work for The North American Company. He has been in Cleveland on many occasions.

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When The North American took over control of our company in 1922 Mr. Doolittle spent months out there in consultation with Mr. Lindsay, then president of the company, and was largely instrumental, I think, in bringing many of our practices, engineering practices and recording practices, into harmony with those of the other North American companies. He worked with me in the period previous to 1931 when we were attempting to work up this pension plan. Mr. Doolittle worked with me on the details of that plan and sat in with me on our negotiations with the insurance companies

in an effort to get that plan into operation and shared with me the decision placing the plan into the hands of the Prudential Insurance Company.

Q. Could you give us some examples of the aid of The North American Company on specific problems? A. I think possibly the best example I could give is the problem that we ran into in connection with this rate investigation by the city.

Q. This recent—— A. This recent investigation by the
2321 city which started in the fall of 1938. Our rate agreement with the City of Cleveland had been in effect since April of 1933 and would have expired in July of 1939. We had expected to do as we always have in the past, open negotiations with the city administration for the passage of a new rate ordinance for a period into the future.

Our policy had been that several months in advance of such an expiration we have contacted the city and discussed

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the matter of a new ordinance and if we were in a position to reduce rates to offer rate reductions which we felt we
2322 could make, and in order to get the rate agreement extended for a period of years.

In the fall of 1938 we were surprised to learn that a councilman, a member of the City Council, had addressed a communication to the Council stating that the Illuminating Company's property and its earning had never been investigated by the City for 25 years and that we had been able to get rate ordinances without really showing the rate of return that we were earning and the amount of our property, and he suggested that the Council employ an independent

engineering firm to investigate the Illuminating Company before our rate ordinance was extended or renewed.

We opposed that. I opposed it. I talked to the Mayor about it and said I did not think that it was necessary, that it would result in expense to somebody, and on the other hand that we were not at all unwilling to let the City see our books and see our property accounts and our earnings if they wanted to. If they would appoint an engineer we would make our records available to him.

That, of course—and the Council proceeded to vote and 2324
appoint such an engineering firm. I felt that it was necessary, if the City were going to make an analysis of our property and our earnings, that we should employ engineers to do the same thing so that we would not have to rely on an engineering firm employed by the City.

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I wanted the engineering firm to be one of high repute. I wanted it to be one that could be truly called an independent firm. I had had no experience with such firms. I knew a number by name, of course. I immediately went to Mr. 2325
Fogarty and we sat down and talked the matter over and we decided that there was one of three or four firms which could properly be called an independent firm for the purposes for which we wanted them. He made an appointment for me with Mr. Gano Dunn of the J. G. White Company and sat in with me while I concluded arrangements with Mr. Dunn and had his firm make this parallel engineering report.

~~The firm employed by the City proceeded to~~—we furnished them office space, gave them access to all our records and gave them any help that they asked us for in getting

the records and they proceeded to make a report based upon the so-called historical cost of our property.

The J. G. White Engineering Company, acting for us, made a report based upon the reproduction cost new, less depreciation value, of our property.

Q. Just a minute, Mr. Crawford. One of the problems in that connection was to determine what part of your property was devoted to the service of Cleveland, itself, wasn't it? A. That is true.

2327 Q. That was the major—in other words, it wasn't merely a question of finding out the historical cost of all your properties, but of determining what part of your property was

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allocable to Cleveland. A. That is true. The two engineering firms were surprisingly close together on the proportion of the property used and useful to the customers of the City of Cleveland, but they approached it from entirely different angles, one based on the historical cost and the other based on reproduction cost new. Our counsel in Ohio advised without reservation that under the laws of Ohio the reproduc-
2328 tion cost new basis was the correct one.

We found that there was a wide difference between the values and the returns arrived at by the two reports and the two reports were finished at about the same time. We decided that it was for us as a company to call the Council's attention to the difference between the two reports and to explain these differences. There was a very wide difference in the valuation arrived at, about $29,000,000 in the net value of the property used and useful for Cleveland, and the engineering firm employed by the City recommended that rate structures be fixed by the City which would result in lower-

ing our rates in the City of Cleveland by something over
$2,000,000 which, if extended to our entire territory——

Mr. Binford: That is for a year?

The Witness: $2,000,000 a year, $2,099,000 in the
City of Cleveland—which, if extended to the whole
territory, as it would have been under our universal
system of rates, would have amounted to something

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like $3,500,000 a year.

We, of course, could not agree to that but in the 2330
preparation of this reply statement which accom-
panied our engineering report, we sat down to write
that reply statement and we in Cleveland were very
indignant and our pens were pretty hot when we
started to write this report. We worked for at least
ten days on it and I asked Mr. Freeman and Mr. Fog-
arty to come out to Cleveland and give us possibly a
clearer look at the problem than we could have our-
selves, having been in the middle of it for months,
and I think I can say that our reply statement was a 2331
masterpiece of moderation and understatement due
to the work that Mr. Freeman and Mr. Fogarty put
on it.

We had a deadline to meet and we all sat up editing and re-editing and marking copy until three or four o'clock in the morning the day before it had to go in to the Council.

That is, I think, the most recent and possibly one of the most graphic examples of the help those two men have been to us. I feel sure that I could not

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nor could anyone of my staff, have gotten that reply statement into the beautiful form in which it was finally finished without the assistance of those two men.

Then the Council, after many hearings, reduced their demands and actually passed an ordinance which would have resulted in our reducing our rates by $1,385,000 per year in Cleveland, instead of $2,099,000. We appealed to the Public Utilities Com-
2333 mission of Ohio and under their instructions prepared to take an inventory and appraisal of our property

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precedent to having hearings on the matter.

Then again we had had no experience in making such an inventory and appraisal since 1914 and the property at that time was a small fraction of what it was in 1939. There again I asked the help of Mr. Fogarty, went to New York and told him ~~my~~ problem of this inventory appraisal, and that we wanted him to employ the best engineering firm that we could get
2334 to do the thing in the best manner and in the shortest time possible.

After discussions and conferences down there Mr. Fogarty put me in touch with Stone & Webster Engineering Corporation. I talked to the president of that corporation, Mr. Muhlfeld, and made an arrangement whereby they would supervise the taking of this inventory and the appraisal and the study of depreciation so that we could have a case to go before the Commissions. They were also to act as expert witnesses in our behalf in those hearings.

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We went ahead full speed. I put Mr. Lindseth in charge of the work on behalf of our Company under the supervision of Stone & Webster Engineering Corporation, and we worked on that from September of 1939 to the latter part of March in 1940. We rented outside space in another building adjacent to ours. We borrowed some of our own people for supervisory help from our operating staff, and employed a lot of engineers and accountants and clerks. As a matter of fact, we had over 200 people working in that other 2336

building on this inventory and appraisal. It was a tremendous job.

We did it under the supervision of the engineers from the Public Utilities Commission of Ohio and I think we were doing a splendid job of inventory, at least so those engineers stated from time to time, that they had never seen an inventory better handled, and they asked us for samples of it to be kept by them in their files as guides for future inventories within the state. 2337

In the latter part of March a member of the Council stated at the Council meeting that this rate case was going to cost the Company a lot of money, was going to cost the City a lot of money, and if the Company won the case, as it seemed to him that they might well do, the Company cost would be handed over to the rate payers to pay back over the period of the ordinance, and suggested that the Company be approached to see whether they would not make a compromise offer which the City could accept.

The Council appointed a small sub-committee to act with the mayor and the director of law in the city to consult with our Company to that end.

We had no idea that the offer was coming and we had then the problem of determining what offer we could make and how far we could go in order to settle their litigation which would be expensive and protracted and with no knowledge of the outcome of it. There again we went to New York and spent a week
2339 down there going over with our executive committee,

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Mr. Freeman and Mr. Fogarty, and by that time Mr. Shea who had come into The North American organization and Mr. Neal there, the rate expert in The North American organization, with our own rate engineers, and we arrived at an offer of about half what the ordinance provided, that we would make rate reductions largely in the residential schedules which would amount to about $840,000 per year in Cleveland and about $1,400,000 in our system.

2340 We drafted formal communications to the City making that offer and in the draft of that communication Mr. Freeman was of great help. The offer was, after much debate and hearings and discussions, accepted and the rate litigation was ended and the inventory work was brought to a close.

All through that period of that rate case we were in constant touch with The North American staff. They advised us all along the line and certainly they were of great influence and help to getting this compromise offer accepted.

It is much to the advantage of the Company that it was accepted and I think much to the advantage of the community. By that means we received a rate agreement which runs four years from July 7, 1940 that would establish our maximum rates for the period of the next four years. Those men were invaluable to us during that period.

Q. I believe that Mr. Lindseth testified at some length as to contacts of The Cleveland Company with other North 2342
American subsidiaries and that you have mentioned several

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of these matters. As president of The Cleveland Company, do you consider that these contacts with the other North American subsidiaries are of benefit to The Cleveland Company? A. I consider them to be a very great benefit. The conferences that we have had in New York among the executive heads of the companies have offered us an opportunity to discuss common problems. In the handling of those problems the methods of the companies are, of course, somewhat different. Our sales methods are entirely different from those 2343
of Milwaukee and St. Louis, for instance, and quite different from those in Washington.

We have, of course, through the years built up a sales policy of one kind and these other companies have built up their sales policies and in some cases they are widely at variance. It gives us an opportunity to discuss whether something that is of value in Milwaukee in sales promotion could be used in Cleveland or whether something that has been proved beneficial in Cleveland might be equally beneficial in St. Louis.

For instance, St. Louis and Washington were away ahead of us in refrigeration, first, and in air conditioning, second. That was probably largely due to the climatic conditions in those cities as compared with ours. It is hot in Washington in the summer and it is equally hot in St. Louis in the summer, whereas our summers are pretty bearable, so they got a great lead due to those climatic conditions in selling refrigeration and in selling air conditioning, and in these con-

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2345 ferences with New York we were able to get from them what they did and what they did not do and it has been a great help to us.

I consider those executive conferences very beneficial. The Station Advisory Operating Committee, as Mr. Lindseth has testified to, from an executive point of view is a very great help to me: For instance, in the building of this new plant which we are putting up at East 70th Street. That plant is being constructed on the mat which supported an earlier plant which was demolished in 1931. We had to make tests of the capacity of those foundations of the earlier
2346 plant to hold the heavier weights which were required for these larger units, both electric generators and boilers, and we were faced with a number of problems.

We made exhaustive tests of the bearing capacity of that concrete mat which is the basis of the foundation. We went to the most expert persons we could learn of and in that connection there was a professor at the University of Michigan. He gave us a report that the foundations were amply strong, but in an effort to make sure of that fact we wanted to make our buildings as light as possible and still be as strong as possible so the question of the weight of the stacks

that would be in this plant; there would be two stacks to exhaust the boilers and the furnaces had we built brick and reinforced concrete stacks such as the other stacks on our plants they would have weighed about 650 tons apiece and

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we wanted, if we could, to get a lighter stack if it could be done with safety and the Station Advisory Operating Committee, our representative on that committee took it up with the committee, and we learned that in Detroit they had had success with a steel stack lined with brick, a welded 2348
steel stack, which instead of weighing 650 tons would weigh about 450 tons. The problem was whether or not that stack would be satisfactory for us because we burn a different type of fuel than Detroit does, with a higher sulphuric content, and this Station Advisory Committee discussed it and recommended that a steel stack be used, but that a special acid-resisting tile or brick be found for the lining. We adopted that recommendation and it was so specified that these stacks would be of that character and design. That is just merely one instance of the value of the Station Advisory Operating Committee. 2349

I know less about the value of the Electrical Committee because I am not an electrical engineer and their meetings are highly technical, but I do know that our engineering staff feels that they have been benefited greatly by these semi-annual meetings of the Electrical Committee.

We have Purchasing Agents' Conferences at which the purchasing agents of the various companies meet and get together for a day or two and they discuss their problems in the matter of commodity prices and trends. I think those are of value.

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The accounting officers, auditors of the Company, have a

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meeting at which they discuss their problems of internal audits and budgets and controls and forms, work orders, etc. I haven't attended those meetings but I get a report from our comptroller on his attendance at the meeting and I know that he feels that those meetings are of value to us.

I think these inter-company contacts are very valuable, have been of value to us and I think they have been of value
2351 to the other companies. For instance, we have had in Cleveland since 1911 a municipal light plant in competition with us. A few years ago there was a movement in Milwaukee to establish a municipal light plant there and Mr. Way asked me if he could send a representative of his company down to discuss with our people the municipal competition, and he sent Mr. Schmidtman.

Mr. Schmidtman, I think, was in Cleveland for two or three weeks consulting with our service department and our sales department and our publicity department, on the matter of municipal competition. I feel certain that he
2352 would not have stayed that long if he had not been getting information that he considered to be of value to him.

Of course, people in Milwaukee decided that they did not want a municipal light company and voted it down, but I have no doubt that that visit of Mr. Schmidtman's would have been helpful to the Milwaukee Company had Milwaukee taken a different course.

Q. Mr. Crawford, you feel that you have a fine Company in Cleveland? A. I think we have the finest Company in the

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United States.

Q. Notwithstanding that fact, do you feel that you have anything to learn from these other companies? A. Oh, a great deal. I think one of the things that an executive must beware of is satisfaction with the results he achieves. Once a company, an organization, or an executive gets the feeling that he is handling the job perfectly he is perfectly certain that that will result in slipping and most unsatisfactory results, and so we feel that while our Company has made an outstanding record in every respect—I don't for a minute
think that we take care of every detail of our business better 2354
than anyone else does. As a matter of fact I know that some of these companies in The North American System do certain things better than we do.

For instance, a year or two ago I noticed that the Milwaukee Company was awarded the C. A. Coffin medal by the Edison Electric Institute. That awarded to them on two bases: fine operation of their power plant at Port Washington, and their outstanding record in reducing the cost of billing and collecting domestic consumer accounts.

This billing and collecting cost was very much lower
than we have ever been able to do it and I did not waste any 2355
time in sending two competent men to Milwaukee and finding out how they did it. Those men spent several days there and came back and told us how they did it.

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Well, part of it was due to their having a new and excellently designed building where they could take care of customer contacts, application for service, payment of bills, adjustment of complaints. It had been studied out to the finest detail in eliminating time and space. They had done

2356 *Eben G. Crawford—By Respondents—Direct*

a magnificent job. We could not do that because we have an old office building which was built in 1912 as a general office building. It was not designed particularly for our purposes as they are now, so that we could not adopt all the things that were done by Milwaukee in this regard but we did succeed in making corrections in our operation which will effect rather substantial savings in the cost per bill.

That will result not only in savings to us in billing consumers, but in reducing the inconvenience to customers in
2357 shortening the time that they are required to be in our office on those matters.

I feel sure that each of these companies has learned a great deal from the other. Station Operating Engineers, Design Engineers, Electrical Engineers, Accountants and Purchasing Agents have meant a lot in the past and I think they will mean a lot in the future, and I think any disassociation of these companies with the result that these committee meetings would be closed out or discontinued would prove expensive to each of the companies.

It might be thought, I suppose, that if the companies
2358 were disassociated that these contacts and committee meetings would continue and they probably would for a period of

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time, but it is my judgment that they would not continue indefinitely. There is a lot of work connected with them. If there weren't some influence brought to bear on members' companies to go I feel certain that from time to time one company might drop out or another one, and in due time there would be no such committees and no such contacts.

As a matter of fact, I know of no other group, or no disassociated companies which have these inter-company

committees and I think the thing that has held them together through the years and will hold them together, is a common mutuality of interest and a common selfish stock interest, selfish in the sense that it means saving money for the companies. I am convinced that they ought to be continued and I think the only way to insure their continuation is to continue a common association and a common ownership.

I would say that the most important benefits of our association with these other companies in The North American group has been this fine help that we have gotten from the 2360
executives of The North American Company at all times on financing and other problems, and the fine results that have been achieved by these committees.

For instance, the Station Operating Committee. I get monthly—I think I have it here with me—inter-company statistics which show the plant operation records of the Ashtabula, Avon and Lake Shore plants of our Company,

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the Lakeside and Port Washington plants of the Milwaukee Company, the Cahokia plant in St. Louis, the Connors' Creek and the Trenton Channel plants of the Detroit Edison 2361
Company, and the Buzzards' Point plant of the Washington Company, Each month I get one of these sheets and our engineers, of course, know that I get it and study it and they vary from month to month, showing that Cleveland at one time has improved their operating efficiencies as compared to some of the other companies, and some other months some of the other companies have the jump on them. This is like publishing the standing of teams in the American League and it has been of tremendous value to us.

Q. Is there a rivalry between the companies, Mr. Crawford? A. There is a very intense friendly rivalry between the companies. It is a rather amusing thing because it means that about four people out of five are bound to be wrong. I am perfectly convinced that we are doing the best job of any company in The North American System, and I insist that we continue to do what I think is the best job of any company in The North American System, but I am sure Mr. Way or Mr. Neal are just as satisfied that Milwaukee
2363 and Washington are far ahead of us in their performances. I think that rivalry not only among the executives but among the operating forces is a great inducement to continue effort towards improving the service and improving the results of the service.

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Q. Mr. Crawford, do I understand correctly that you feel that the common stock ownership which links these companies together is essential to this rivalry and to this continued close contact? A. Well, I feel very strongly that that is the case. Due to this common ownership and this
2364 mutuality of interest we exchange information with these companies that we would not think of exchanging generally.

Q. Who, in your company, passes on interchange of information with other companies? A. Well, all requests for such interchange of information go to Mr. Hough, our vice president and general manager, and if there is any question at all as to whether or not the information should be given the matter comes to me and I make a decision as to whether or not it shall. No information is passed out of our company without my knowledge and approval of it.

Q. That is, you have established the general policy and also pass on specific cases? A. Yes, that is a Company order.

Q. So that The Cleveland Company is not exchanging information with other companies except as you, yourself, permit or direct it? A. I would say that this is true except with possibly unimportant matters. If a company were to write us and say "Do you do your own tree-trimming or do you have it done by contract?" that would not be referred to me,

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but on matters of information as to our operations or our costs or any of that sort of thing would have to come to me for my approval.

Q. Now, as president of the Company, do you permit the intimate exchange of detailed information with non-associated companies?

The Witness: Will you read that question?

(Pending question read back.)

Mr. Binford: I object to the question until the word "non-associated" is clarified. Do you mean companies which are not part of The North American System? 2367

Mr. Browning: Right.

Mr. Binford: If you make the question that way I will withdraw the objection. Is the question so changed?

The Witness: Will you read that again now?

Mr. Browning: Let me rephrase the question.

As president of the Company, have you permitted the intimate exchange of detailed information with

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companies which are not subsidiaries of The North American Company, other than Detroit Edison?

The Witness: No, I have not.

By Mr. Browning:

Q. And would you permit such exchange of intimate information with any such other companies? A. Well, I would have to weigh that matter in each specific instance

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2369 before I would consent to give it. I can't say that I would not give another company information that they asked for, but as a matter of practice we don't do it and unless it was on some specific matter where we could not see that it would have any effect on our operations, I would refuse such requests for information.

Q. Mr. Crawford, will you tell us what has been the effect of North American control of your Company upon localized management of your Company? A. I think the control of our Company by North American Company has had no effect whatever upon the local nature of our management in Cleve-

2370 land or of our organization. Our staff is composed of people long resident in Cleveland, most of whom have spent their life in service of the Company.

The public realizes and feels that in dealing with us it is dealing with a Cleveland organization. I don't see how any organization could be more local in its character than is the whole employee body of The Cleveland Electric Illuminating Company.

As president of the Company I have complete control over the operations of the Company, subject to the general super-

vision of the board. There have been no limitations placed upon my authority. I have full authority to deal with any problem that may come up. My judgment and my decisions have never been overruled by a board. I have never been asked to take any action of which I did not fully approve.

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On the other hand, all the time that I have been president of the Company I have been in close contact with the executives of The North American Company. We have constantly
discussed the problems of the Company and these discussions 2372
have not been just perfunctory. They have run for hours and sometimes for days.

Sometimes I have gone down there to get their opinion merely to confirm my own judgment in the matter and to share the responsibility with me of having made this decision. Many times I think I have gone down there with my mind made up on a specific problem and after conference with Mr. Freeman and Mr. Fogarty and Mr. Shea, I have probably changed my mind or modified my decision in the matter.

I don't know that in any one instance such as, for in- 2373
stance, the determination of this compromise offer in this rate settlement with Cleveland, I could not say that I or any other one participant in that was the originator of the settlement finally arrived at. Those men are of great value to me because—well, they are not into the detail, they can see the forest without being obstructed by trees, as it were. They are men who not only know our problems, but in many cases have met the same problems in their other companies and they are experienced in those other subsidiaries in large cities and have certainly been of great help to us.

Then, they have a very strong interest, I think, in arriving at the proper solution, helping me to arrive at the proper

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solution of our Cleveland problems in the size of the investment that they have, the stake that they have in the property. That is a very important thing.

I have often found that the thing that seems to me to be a rather weighty problem has already been met in other companies and the proper answer been found. I think prob-

2375 ably in the seven years that I have been head of The Cleveland Company I have averaged fifteen visits a year, at least that many, in the office of The North American Company, and many times Mr. Fogarty and Mr. Freeman, particularly, and Mr. Piske occasionally, have been out to see me.

I am sure that not a week goes by that I am not in contact with Mr. Fogarty or Mr. Freeman or Mr. Shea, or all of them, by telephone. I keep in constant touch with them. Their help has been invaluable. I don't know how you would value it in money but it has given me a very substantial backing in important decisions.

2376 It would certainly be greatly missed if that help were taken away. Of course, if our stock was divided up among a lot of people, I don't think there would be anyone who would have a sufficiently great stake in the Company to devote the time and effort.

For instance, I think my selection to be president of this Company, which was certainly made by The North American Company, probably would not have been made—I mean that

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I probably would not have been selected to be president of this Company on the occasion of Mr. Lindsay's death if there

had not been someone who, by contact with me and knowledge
of my capabilities, could make that decision. I had been
secretary of the Company for many years and as a rule
presidents of large corporations are not succeeded by secre-
taries of that organization. It resulted through Mr. Lind-
say's long illness and the many contacts that I had with The
North American Company that they, having, of course, the
controlling stock ownership, could nominate me as president.
They did and I have been very happy in it. The job has
been made easier by these fine associations and the help I 2378
have gotten from these men. I don't like to think of the
possibility of that help being withdrawn and I hope it won't
be.

Q. Would an independent engineering or management
firm take the place which North American has with you?
A. I don't know what you mean, Mr. Browning. Do you
mean could the Cleveland Electric Illuminating Company
employ a management concern that would be a fit substitute
for the help we have gotten from The North American Com-
pany?

Q. Yes. A. I don't think it would be possible. 2379

Q. Why not? A. Well, because of the long acquaintance
that these men have had with our operating problems. I
don't think we could retain elsewhere in any one place the

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all around help from many points of view that have been
given to us by the staff of The North American Company.

Q. Well, do you feel that the element of common stock
ownership has any importance? A. I think that it is the
important element. The North American Company has a
tremendous investment in Cleveland. It is these men's job

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to help the local management operate these companies. I think it is the strongest possible factor.

Mr. Browning: That is all.

Mr. Binford: Mr. Examiner, I wonder if we could recess until 1:30 o'clock, at which time I would be prepared to go on with cross examination. It is now after eleven.

The Examiner: I think that is in order. We will recess until 1:30 o'clock.

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(Whereupon, at 11:10 o'clock the hearing recessed, to reconvene at 1:30 o'clock p. m.)

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AFTERNOON SESSION.

(Whereupon, at 1:30 p. m., August 16, 1940, the hearing was resumed.)

The Examiner: Let us resume, gentlemen.

Whereupon, EBEN G. CRAWFORD, the witness on the stand at the time of recess, resumed the stand and testified further as follows:

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Cross Examination by Mr. Binford:

Q. I believe you testified, Mr. Crawford, that the advice and assistance of Mr. Fogarty, among others, of The North American Company, was of great value to you in your recent financing, is that true? A. That is very true.

Q. Mr. Fogarty not only advised you in connection with the most recent bond financing of your company, but also negotiated—and I believe you said fought or struggled—with the underwriters, in connection with the final completion of the deal, is that true? A. Will you say that again, please? 2385

Mr. Binford: Please read that.

The Witness: Ask that again, please.

(Whereupon the pending question was read back by the reporter.)

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The Witness: Mr. Fogarty began the negotiations with the bankers on our behalf and, in the final negotiations with the bankers, with respect to the price at which the bonds would be sold, he sat with me in

those negotiations and shared with me the burden of getting the best possible price for the bonds, which I think we succeeded in doing.

By Mr. Binford:

Q. You testified, on direct examination:

> "Mr. Fogarty handled all necessary negotiations with the bankers, except getting down to the final
> 2387 trading for a half point, when I stepped in and reinforced him somewhat."

That is a correct statement of the situation? A. Substantially correct, yes.

Q. Yes. It may be modified by the remainder of your testimony on that subject, on direct examination. A. Yes.

Q. You also testified that no members of your staff were particularly familiar with provisions common to mortgage indentures securing bond issues—that is true, is it? A. No members of our staff are familiar with such things.

2388 Q. And that you received assistance in connection with the mortgage indenture executed to secure the bonds most recently issued by you from the officials of The North American Company? A. The officials of The North American

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Company were very actively of assistance in arriving at the provisions of the mortgage.

Q. Who drafted the mortgage indenture? A. The mortgage was, I presume, drafted by our counsel with the assistance of the staff of The North American Company as to detail.

Q. What individuals of your counsel? A. I would say that Mr. Cissel of Sullivan and Cromwell, Mr. Bickel of Squire, Sanders and Dempsey, principally.

Q. Squire, Sanders and Dempsey are a firm of attorneys practicing in Cleveland? A. That is true.

Q. Where was the indenture drafted—in New York? A. In New York.

Q. Do you know if a member of the Cleveland firm was in New York continuously during the drafting of that indenture? A. Mr. Bickel was there continuously. I say "continuously"—practically continuously; I don't know but that he may have been back in Cleveland for a day during that period, but he worked continuously on that indenture with Mr. Cissel. 2390

Q. Mr. Fogarty made or carried on all the preliminary negotiations with the underwriters, up to the time when agreement in final form became necessary as to price and spread? A. Mr. Fogarty carried on all the negotiations up

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to that point, with this exception, that at a meeting—at an underwriters' meeting, held in the offices of The North American Company, I attended that meeting, which was presided over by our counsel, and answered such questions as underwriters' representatives cared to ask about the Company and the property and the operations of the Company. 2391

Now, that is the only time that I appeared in what might be called the negotiations, until the final conference at which the price was fixed.

Q. What was the date of the conference, which you mentioned as being presided over by your counsel? A. It was

on Tuesday before the offering. The offering was on Friday, I think, July 19.

Mr. Browning: That is right.

A. (Continuing) And this conference, I think, was held on the Tuesday before that.

By Mr. Binford:

Q. Prior to that time did any official of your company,
2393 by which I mean The Cleveland Electric Illuminating Company, who was not also an official of The North American Company, represent the Cleveland Company in any negotiations with underwriters? A. Did not.

Q. You say that your counsel presided over the particular meeting that you mentioned. Which of your counsel?

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A. Mr. Cissel of Sullivan and Cromwell, and Mr. Bickel of Squire, Sanders and Dempsey was present.

Q. Where was that meeting held? A. That was held on the 16th floor of a building on 60 Broadway in that city.

2394 Q. That is the building owned by a subsidiary of The North American Company? A. That is right; in which the offices of The North American Company are located.

Q. Does your company maintain an office or office space at that address? A. Yes, we do.

Q. Of what does your office force there consist? A. We share rent for a certain amount of space on the 18th floor of The North American building, with two other of the associated companies, and we share in the salaries of a group of employees located on that floor. That group of employees

consists of Mr. C. E. Neil, who is a rate engineer, Mr. W. C. Leinig, who is a statistician, and—I am not sure of Mr. Johansen's initials——

Mr. Hamilton: (Interposing) J. G.

A. (Continuing) ——J. G. Johansen, who is assistant secretary of our company, and various clerks and stenographers.

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By Mr. Binford:

Q. This office is maintained continuously by your company? A. It has been maintained continuously for a number of years. 2396

Q. How many years? A. I think since 1935.

Q. At what expense during the year 1939, as nearly as you can state it? A. I would say, as nearly as I can state it, about 20 thousand dollars.

Q. To whom do you pay that 20 thousand dollars—to The North American Company? A. We are billed for our proportion of the salaries of these employees, and we send the check to Mr. Johansen, who is an assistant secretary of 2397
our company.

Q. Of your company? A. Yes.

Q. Who bills you? A. I think Mr. Johansen—just on a statement, I mean, of our share. I don't know how the bill is made out.

Q. He doesn't bill you on any particular letterhead in any particular capacity? A. I can't say as to that.

Q. Do you know who makes the allocation of 20 thousand dollars—or whatever it may be—to you each year? A.

It is done at cost and it is proportioned, and I don't know the exact proportion. I think it closely approximates a third to each oi the three companies—The Union Electric of St. Louis, the Milwaukee Company, and ourselves.

Q. You mean The Union Electric Company of Missouri? A. Of Missouri, yes.

Q. You don't know who figures those costs, then? A. Well, I assume that Mr. Johansen figures them.

Q. You assume that? A. Yes.

2399 Q. As an officer of your company, isn't Mr. Johansen directly under your control and supervision? A. He is under my control and supervision in his duties as an officer of the company, of course.

Q. But you are not sure as to whether or not he figures the costs personally on this matter? A. I can't be sure of that.

Q. This office space is rented from The North American Company or from 60 Broadway Building Corporation? A. It is leased from the Building Corporation.

Q. Which is a subsidiary of The North American Com-
2400 pany? A. As far as I know, it is.

Q. The 20 thousand dollar figure which you mentioned as the approximate cost of the New York organization to you

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during the year 1939—would that include the rent? A. That includes the rent, yes, sir.

Q. That is, your portion of the rent? A. Our portion of the rent, yes, sir.

Q. Do you fix the salaries of the employees in that office? By "you", I mean you personally as president. A. Oh, no, I do not.

Q. Do you know what they are? A. I don't know exactly what they are. I know about the range of them.

Q. Did you employ any of the members of the staff of that New York office yourself? A. No, I did not.

Q. Was the employment of any of them made by your Board of Directors? A. The election of Mr. Johansen as assistant secretary of the Company was made by the Board.

Q. How long has Mr. Johansen occupied that position? A. Well, I couldn't say. For several years. 2402

Q. Has he occupied it since prior to the time that you became associated with The Cleveland Electric Illuminating Company? A. Beg pardon?

Q. Has he occupied it since prior to the time that you became connected with the Cleveland Company? A. Oh, no.

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Only in the last few years. He is a young man.

Q. Who occupied the position held by Mr. Johansen immediately prior to the time when he was elected to that position? A. I think, before this arrangement was made, that
Mr. Sealy was—the treasurer of The North American Com- 2403
pany was an assistant treasurer of our company. I don't think we had an assistant secretary.

Mr. Browning: Let me interrupt there.

The Witness: I am relying on my memory. I haven't any record books here.

Mr. Browning: Don't you think Mr. Piske was the assistant secretary?

The Witness: Well, I don't know. I don't remember.

By Mr. Binford:

Q. But there was someone who occupied that position? A. That is right. We had an assistant secretary or treasurer in New York.

Q. What did Mr. Johansen do? That is, what was his occupation prior to the time when he—— A. (Interposing) —He was employed by The North American Company.

Q. In what capacity? A. I don't know that he had any
2405 official capacity at that time. He was employed under Mr.
—1,172—
Piske.

Q. Where does Mr. Johansen live? A. He lives in New York, as far as I know.

Q. He doesn't live in Cleveland? A. No.

Q. Has he ever lived in Cleveland? A. No, sir, as far as I know.

Q. What are his duties in so far as your Company is concerned? A. Well, his duties are—he has authority to sign as an assistant officer for us. He did so sign in the
2406 recent bond issue. He and the rest of that department furnish us with statistical information with respect to the other companies of the North American group. They furnish the stock exchange with the required information. They get out confidential reports to insurance companies, to state banking departments, they answer inquiries of investors, investment bankers, and do quite a substantial amount of work.

Q. I will ask you to refer to Respondents Exhibit Number 30—— A. (Interposing) May I have a copy of it.

(Mr. Hamilton hands a document to the witness.)

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Q. (Continuing) ——which is the organization chart of The Cleveland Electric Illuminating Company. Is Mr. Johansen's position or staff reflected in this chart? A. I

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think not. It is our operating chart in Cleveland.

Q. Are there any other paid officers or departments of your Company that are not reflected in the chart? A. No, there are no other such officers or employes that are not reflected in this chart.

Q. Could you state what Mr. Johansen's salary from your 2408
company is? A. I can't state with any degree of positiveness. It is very small—his salary from our company.

Q. I presume that, if any expenditures are made on behalf of The Cleveland Electric Illuminating Company by your New York staff, your company is billed for those expenditures? A. Undoubtedly.

Q. I am speaking of disbursements or expenses incurred in addition to your pro rata part of the normal running expense. A. As I understand it they have a petty cash account down there, which they account for to our treasury department periodically, and are reimbursed for expenditures out 2409
of that petty cash fund.

Q. Would you classify Mr. Johansen as an expert in financial matters? A. I wouldn't know as to whether Mr. Johansen was expert in financial matters, with respect to negotiation of loans or financing of that sort. I think he is

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very expert in the details of arranging of closings and financial operations.

Q. You don't know what his total compensation is from The North American Company and the various subsidiary

companies which he serves? A. I don't think he is an employee of The North American Company.

Q. When you stated a while ago that, prior to the meeting which you mentioned as being presided over by your counsel, with the underwriters, in the latest financing of The Cleveland Electric Illuminating Company, you had had no previous contact with the underwriters, did you include correspondence and telegraphic or telephonic communications, as well as personal conversation? A. I had had
2411 no contacts with him whatever, of any character.

Q. Who selected the underwriters, then, or do you know? A. Well, Dillon-Read selected participants in the syndicate —Dillon-Read were selected by us and they formed their own syndicate.

Q. When you say "by us"—— A. (Interposing) By Mr. Fogarty and myself.

Q. (Continuing) ——what persons do you mean? A. By Mr. Fogarty and myself.

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Q. But you didn't contact Dillon-Read yourself, person-
2412 ally. A. Not in the early stages, no. I knew that Mr. Fogarty was in contact with Dillon-Read.

Q. And Mr. Fogarty selected your New York counsel? A. Mr. Fogarty—pardon me?

Q. Selected your New York counsel in that case, too? A. Sullivan and Cromwell have been our New York counsel for many years.

Q. Over what period of years? A. They have participated in our financing for as many years as I have been with the Company, representing us in New York in the

financing. They have been on a retainer from us for a number of years—I wouldn't like to say how many, but for a good many years.

Q. Would you say that they had ~~been so~~ retained since The North American Company acquired control of The Cleveland Electric Illuminating Company? A. You mean by that, during all the period——

Q. (Interposing) Yes A. No, I think it hasn't gone back as far as that.

Q. Did The Cleveland Electric Illuminating Company 2414
have New York counsel prior to the time when The North American Company acquired control of The Cleveland Company, do you know? A. I do not know. I know that we had

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no permanent counsel.

Q. Were you consulted? In this case, by "you", I mean you personally. Were you consulted as to the houses which should be included among the underwriters selected by Dillon-Read for your last financing? A. Yes, I was.

Q. To what extent? Merely to the extent of those in Cleveland who should participate? A. That is true. Merely 2415
as to those who were in Cleveland and in Ohio.

Q. Approximately what figure in dollars was the amount of the underwriting spread on this latest Cleveland financing? A. It was two points on 50 million dollars. That would be one million dollars.

Q. Dillon, Read & Company was the manager of the underwriters in that transaction? A. They were underwriters.

Q. How much was the management fee? A. I do not know.

Q. If that figure is revealed in the registration statement and amendments, as filed with this Commission in connection with that issue, the figure so revealed would be correct, would it not? A. I would assume so.

—1,177—

Q. In other words, you checked or caused to be checked the registration statement filed here, before it was filed? A. Oh, yes.

Q. What counsel fees were paid in connection with that?

2417 Mr. Browning: I don't like to object, Mr. Examiner, but I don't quite see the relevancy of this line of questioning.

Mr. Binford: Mr. Examiner, there has been a great deal of direct testimony here, to which I didn't object, for the purpose of showing the local control and the desire upon the part of the management to put money into circulation in Cleveland by local purchases. I believe that the other side of the picture should be brought out, too.

2418 The Examiner: I believe that refers to the question on direct examination. I will overrule the objection, if it was an objection.

Mr. Browning: I don't object, particularly, to the question, because it is a matter of public record. I just thought we were getting a little far afield.

The Witness: Is there a question not answered?

Mr. Binford: Yes.

The Witness: What was it?

Mr. Binford: Read it, please.

(Whereupon the pending question was read back by the reporter.)

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The Witness: The total of the counsel fees, as I remember it, was 40 thousand dollars.

By Mr. Binford:

Q. Do you know what proportion of that went to Cleveland counsel? A. I do.

Q. How much? A. 16 thousand dollars. 2420

Q. There was a great deal of printing and engraving done in connection with that financing, was there not? A. A very great deal.

Q. Approximately how much did those expenditures amount to? A. It would only be a guess, if I answered that. I don't know.

Q. You don't know approximately? A. I do not know approximately. It would be a guess. I have an opinion, but I don't know.

Q. Would you say it was in the neighborhood of five, ten or twelve thousand dollars? A. My impression is around 2421
nine thousand dollars, but I am not sure of that.

Q. Who made the arrangements for that printing and engraving to be done—what individual? A. What individual?

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Q. Yes. A. I think Mr. Hartel, the secretary of The North American Company, probably made those arrangements.

Q. Mr. Hartel lives in or near New York, is that true? A. Yes.

Q. His office is at 60 Broadway? A. His office is there.

Q. New York City? A. New York City.

Q. Did Cleveland or Ohio firms do the printing and engraving? A. No. The American Bank Note Company printed the—— The temporary bonds, you mean?

Q. Whatever printing or engraving that had to be done. A. Well, the American Bank Note Company printed the temporary bonds, and a New York printing firm did all the other printing. I have forgotten the name of that firm. No Cleve-
2423 land firm would have been equipped to do that printing in the time that was available for doing it.

Q. The familiarity of the officials of The North American Company with such matters, and with firms which were in a position to do that type of work, was of value to you in that connection, too, wasn't it. A. It was of great value to

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us. This was a very high speed operation from start to finish.

Q. You have already dwelt upon Mr. Fogarty's knowledge of technique and practices of financing operations, and
2424 their value to your company. I suppose you also benefiitted, you feel, from Mr. Fogarty's personal acquaintance and knowledge of investment banking firms and their reliability. A. Yes, that is true.

Q. I believe you stated that the members of the Executive Committee of The Cleveland Electric Illuminating Company exercised powers of the Board between the meetings of the Board of Directors, is that true? A. Yes, that is true.

Q. And you further testified that this Executive Committee was composed of yourself, Mr. Fogarty and Mr. Freeman? A. That is correct.

Q. How often does the Executive Committee customarily meet? A. Well, it meets formally only when some formal action of the Committee is to be taken. It meets informally very many times in a year. We might, in some years have the minutes of three formal actions by that committee, and another year it might be two, another year it might be four, but we are in constant communication with each other, and I spend a great deal of time with Mr. Fogarty and Mr. Freeman in New York on matters of which no record is made of

—1,181— 2426

the minutes.

Q. In other words, if quick action is required on some important matter, you may call Mr. Fogarty and Mr. Freeman by phone and get their opinions and act on the consensus of opinion of the three of you, as on the authority of the Executive Committee as such, is that true? A. On any emergency of any kind, of any importance, important matter, I would endeavor to have a meeting by going to New York or inducing Mr. Fogarty or Mr. Freeman to come out to Cleveland, and we would make a minute of formal action to be approved later by the Board. 2427

On just general routine matters of operation and management, if I know that I am going to be in New York within a few days, why, I may defer acting on it until after I have been to New York and had a talk with Mr. Fogarty and Mr. Freeman.

I can see where at times I may have called one or both of them on the phone and asked them to talk it over among themselves and call me back and, when we were agreed upon it, I would proceed.

Q. About how often do yor usually make a trip to New York? A. I would say it would be an average of about once a month.

—1,182—

Q. And your stay in New York at that time usually covers a period of two or three days? A. Very often only one day or maybe two days or maybe three days. I get out of New York just as quickly as I can. I stay long enough to do the business that I went down to do and leave as early
2429 as I can.

Q. Is there usually a formal meeting of the Executive Committee each time you go to New York? A. There are no formal meetings unless we have some formal action to take. It is a case of sitting down around a table for an hour or two or three or eight, discussing the matters that are up at that moment.

Q. I believe you stated that no action of the Executive Committee had ever been overruled by the Board. A. That is true.

Q. I believe you also stated that, as far as you can recall,
2430 since you had been president, there had never been any action by the Board that was not unanimous. A. As far as I can remember we have never had a dissenting vote on any action taken by the Board.

Q. What was the name of the gentleman whom you spoke of as possibly occupying the position as representative of the minority interests on the Board? A. Mr. W. H. Fillmore of Cincinnati.

Q. Why did you so characterize him in your direct testi-

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mony? A. Well, Mr. Fillmore became a director of our company, I think I testified, in 1907—at least away back—and a large amount of our common stock was owned in Cincinnati and Mr. Fillmore, in those early days, used to solicit proxies from the minority stockholders and was usually elected by means of those proxies. As long ago as—well, ever since The North American Company has been in control of The Cleveland Electric Illuminating Company, their stock has been voted for the election of Mr. Fillmore, I think, even beginning in 1922, so that, while he originally was elected 2432
to the Board by the votes of the minority stockholders, he has received the votes of all proxies ever since 1922.

That was the cause of my reference to him as possibly being considered a representative of the minority.

Q. He himself is a stockholder? A. Yes, he is a stockholder.

Q. Do you know approximately how much stock he owns? A. He owns a very substantial amount.

Q. Would that mean two hundred or three thousand shares, or in what way—— A. (Interposing) I would say in excess of three thousand shares. 2433

Q. When was the last stockholders meeting of The Cleveland Electric Illuminating Company? A. Our stockholders

meeting is held the last Wednesday in March of each year, so it would have been in the latter part of March this year.

Q. It was so held this year? A. It was, yes.

Q. Do you know how many persons attended in person? A. Not a soul other than the proxies. It was the first time in our history. That is why I happen to remember that. We

usually have two or three to eight stockholders present. Each stockholder, however, got notice of the meeting.

Q. Accompanied by a blank proxy form? A. That is right.

Q. Do you know what percentage of the total voting stock was represented—I started to say "in person or by proxy"; I mean "by proxy". A. I can only say approximately, but I think, as a rule, that between 90 and 92 per cent. of our stock votes at annual meetings, and that includes the com-
2435 mon and the preferred shares.

Q. You are speaking, now, in general? A. In terms of the proportion of the total outstanding stock that is voted.

Q. But you are not speaking of this particular meeting in March 1940? A. No. I can't state as to the percentage at that particular meeting, no.

—1,185—

Q. I presume that the stock was voted unanimously in favor of each resolution that was passed? A. That is true.

Q. To whom did the proxies so solicited run? A. I think
2436 they ran to E. G. Crawford, F. M. Cobb, and W. H. Fillmore.

Q. You or Mr. Cobb, I presume, cast the ballots? A. No. We all cast a ballot.

Q. The three of you, then, were present? A. The three of us were present.

Q. Then, members of the Board were unanimously re-elected at that time? A. Yes, sir.

Q. How often do your directors meet? A. Our directors meet regularly quarterly and at special meetings at the call of the president.

Q. How many special meetings were there in the last calendar year? A. You mean in the last twelve months or in 1939?

Q. In 1939. A. I don't know that there were any. There may have been, however.

Q. In speaking of the period of your service shortly prior to the time that you became president of the company, when

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your predecessor was ill and was not expected to live, I be-
lieve you stated that you understood it was decided upon at 2438
that time that, in the event of the death of your predecessor, you would succeed him. By whom was it so decided upon? A. I didn't mean to state it as definitely as that.

Q. Possibly you qualified it as tentatively decided upon. A. I had many conferences with Mr. Dame who was chairman of the Board of The North American Company at that time, Mr. Gruhl, who was president of The North American Company at that time, and Mr. Fogarty, who was vice president of The North American Company at that time.

I advised them of the serious condition of Mr. Lindsay's 2439
health, and was told by them to proceed to act on behalf of Mr. Lindsay, by the management of the Company, and then, in February of that year, of the year of his death, which was 1933, Mr. Gruhl died—Mr. Gruhl, the president of The North American Company died.

Before he died, however, the matter of making me vice president of the Company, as well as secretary, had been discussed by Mr. Dame, Mr. Gruhl and Mr. Fogarty, with me, and I think the meeting at which I was elected vice president was held just after Mr. Gruhl's death, and it was held

2440 in Charlottesville, which was Mr. Lindsay's home at that time. He lived down there for a year before he died.

—1,187—

I was elected vice president and secretary at that meeting, and Mr. Lindsay, who presided as president of the Company, advised me of my election. I had been advised by the gentlemen I spoke of in New York, that that action would be taken, before that, and that, in Mr. Lindsay's absence, I would have to carry on, and that I could carry on better
2441 during the rest of his illness as a vice president than I could as secretary of the Company.

I think that probably is as far as it was assumed that I was to succeed him, but it was certainly my understanding that I was, and it eventually came about.

Q. Has Mr. Johansen ever attended a meeting of the Board of Directors, or appeared before your Board of Directors? A. I think not. We have had meetings in New York on a number of occasions, but we have always taken with us Mr. Hall, the secretary of the Company, to act as secretary at those meetings.

2442 Q. That is to say, your Board of Directors has had meetings in New York? A. Oh, yes.

Q. At 60 Broadway? A. At 60 Broadway.

Q. What was the latest financing done by your Company prior to the recent 50 million dollar bond issue of this year.

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A. That was in 1935.

Q. Will you describe briefly what that was, please? A. Well, in the first place, we sold 40 million 3¾ per cent. bonds

and retired a like amount of five per cent. bonds. We reorganized the capital stock of the Company and converted certain common shares into something like ten million dollars of preferred shares.

We also authorized an additional amount of 4½ per cent. preferred stock to be sold by the Company to retire the six per cent. preferred stock, which had been issued in 1923 and '24 and '25.

The bonds were sold by a syndicate headed by Dillon, Read and Company. 15 million plus were new stock 4½ 2444
per cent. preferred stock, issued by the Company, was sold by Dillon, Read and Company, and The North American Edison Company, I think, that held the stock in those days, also sold a block of the preferred stock, which came to them through the conversion through a syndicate headed by Dillon, Read & Company.

Q. North American Edison Company, since that time, has been dissolved and its assets taken over by its former parent—— A. (Interposing) That is my understanding.

Q. (Continuing) —its former parent, The North American Company, is that true? A. That is my understanding. 2445

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Q. And it was at that time a subsidiary of The North American Company? A. Yes.

Q. Were you familiar with the details of the 1935 financing? A. I was very familiar with it at the time.

Q. Were they handled in a manner somewhat similar to that which you have described as being the manner in which the 1940 bond financing was handled? A. I would say that, as far as the bonds were concerned, the issuance of 40 million

dollars in bonds, the same general trend of events took place, although they didn't take place at such great speed as we were forced to use in this last operation.

With respect to the preferred stock, there were two separate operations. The Illuminating Company arranged with Dillon, Read & Company to form a syndicate to sell the 15 millions of new preferred stock that we wanted to sell, The North American Company, I think, made similar arrangements to sell the stock that we were offering for sale.

2447 Q. You don't recall the approximate amount of spread in dollars, realized by the underwriters in connection with that financing? A. I think I do, with respect to ours.

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Q. Yes. A. I think the spread was two points on the bonds and two and one-half points on the preferred stock.

Q. Which would amount to approximately how much total in dollars? A. Well, I will have to do a little figuring here. Off the record.

(Discussion off the record.)

2448

A. I think that the cost to the Company on the 40 millions of bonds was approximately $800,000.00 and on the 15 million of preferred approximately $380,000.00, making a total of something less than $1,200,000.00.

Q. In each of the instances which you have mentioned Dillon, Read & Company was the syndicate manager of the underwriters? A. That is true.

Q. And in each instance which you have cited, the attorneys representing your Company were the same? A. In each instance in these recent financing, our attorneys were the

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same—Sullivan and Cromwell of New York and Squire, Sanders and Dempsey of Cleveland.

Q. By "recent financing", you include all the financing you have so far mentioned? A. Yes.

Q. Reverting to your New York office, in addition to the

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sum of approximately 20 thousand dollars paid out by your company for its portion of the maintenance of that office during the year 1939, could you state approximately how 2450
much your company paid out through that office by way of extraordinary expenditures of any character, made by that office, for which you were billed? A. Why, I wouldn't know, but I would think it would be so small as to be negligible. I can think of no item of any size at all that we so paid.

Q. The North American Company does no servicing of any character for your company, for which you are billed? A. No, they do not.

Q. Who suggested the 1935 financing? A. Mr. Fogarty.

Q. I believe you said that, in connection with the 1940 2451
bond financing which had been theretofore discussed, Mr. Fogarty some nineteen days or so before the transaction actually took place called you, suggesting that it might be a good time for that financing to take place. A. And that, if it were done, that it should be done very promptly, because of a number of reasons to which I testified, I think.

Q. And you agreed with that suggestion and the matter was accomplished in that way? A. Yes.

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2452

Q. Approximately how far is your territory from the territory of the Detroit Edison Company? By "your territory" I mean the territory served by your company. A. You mean the western boundary of our territory with the——

Q. (Interposing) Yes. A. (Continuing) ——with the nearest boundary of the Detroit Edison Company?

Q. Yes. A. I should think it might be somewhere between 120 and 140 miles.

Q. No interconnection of any character? A. There is no
2453 interconnection.

Q. The territory served by your company is not interconnected with the area serviced by any other operating company of The North American Company system? A. No, it is not.

Q. Except possibly through other systems in the middle west area? A. I think I can say——

Mr. Browning: (Interposing) Just a minute. Will you read that, please?

By Mr. Binford:
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Q. Except possibly through other systems in the middle west area? A. It is not interconnected in any way that I

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know of.

Q. You have only one interconnection with another system, isn't that true? A. That is true.

Q. That is with the Ohio Edison Company? A. That is with the Ohio Edison Company.

Q. You don't know what the interconnections of the Ohio Edison Company are? A. No, I do not.

Q. I believe you stated that the general counsel of your company lives in Cleveland. A. Yes.

Q. And is a member of your Board? A. He is a member of our Board, lives in Cleveland, and has his office in our building.

Q. Is he engaged also in the practice of law for other clients other than The Cleveland Electric Illuminating Company? A. I think not.

Q. He is employed upon an annual salary, then? A. He 2456
is employed on an annual retainer.

Q. With additional compensation for extraordinary services? A. No. No additional compensation.

Q. In the case of extraordinarily large expenditures of

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funds, such, for instance, as in the installation of a new steam generating unit, would the conclusion of a purchase be made by you without prior conference with the other members of the Executive Committee? A. No, it would not. It would originate with me through a study by myself and
our staff, of the requirements. The determination—or the 2457
recommendation as to where it should be located, the size of the station, the type of equipment which would go into the station, would be determined by us, a budget addition—a budget project would be—showing the estimated cost of it—would be prepared, and that budget would be submitted by me to the other two members of the Executive Committee for approval, or, if a board meeting were to be held shortly, it would be submitted to the Board and the matter would be discussed and action taken, either by the Executive Committee or the Board, before expenditures were actually made.

Q. You would not choose definitely from which of the three or four companies in the market to supply such equipment as I have mentioned, as to the one from which you purchase, without prior authorization from the Executive Committee or the Board? A. I would do it without formal authorization, because I would discuss with the Board and tell them what my plans were as to the equipment that would be ordered, but there would be no formal action, either by

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2459 the Board or the Executive Committee, on the make or the type of equipment.

Q. Nor from the concern from which it is purchased? A. No. Nor the concern from which it is purchased.

Q. In other words there would be no minute of it; it would be merely an informal discussion? A. That is right.

Q. But there would be such informal discussion if the amount involved were large? A. I would say that was correct, yes, and in that connection, in discussing with the Executive Committee, I would state that I propose to buy

2460 with their approval a 60,000 kilowatt generator from the General Electric Company, and that I propose to buy sufficient boiler capacity from any one of two or three boiler firms, and in every case they have approved my judgment in the matter.

Q. From which office of your company are notices of meetings and proxy forms sent out—from the New York office? A. From Cleveland.

Q. From Cleveland? A. Yes.

Q. You mentioned the several standing inter-company committees of The North American System, including the

Station Operating Advisory Committee and certain other

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committees. Have you ever attended a meeting of one of these committees personally? A. No, I never have, except of the executive conferences. I have never attended a meeting of the technical committees—none.

Q. How often do you have meetings of the executives of the companies? A. Well, we had a meeting June 12 and June 13, I think it was, and it was proposed that we should have another one in August. 2462

Q. That is, this year? A. This year. And the meeting was postponed because it was said that we were all too busy to have a meeting at that time, and it was deferred.

Q. When was the last one prior to this latest one? A. Well, the first one to be had was in June of this year. It followed Mr. Shea's coming into The North American Company —the first formal meeting of the executives.

Q. During your incumbency of the presidency of the Cleveland Company? A. That is right.

Mr. Binford: I have no further questions at this time and I don't anticipate having any further questions, but I should like to reserve the right to recall Mr. Crawford for further cross-examination, if it appears appropriate, later in the case. 2463

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Redirect Examination by Mr. Browning:

Q. Mr. Crawford, I am not sure that, in your description of individuals whose compensation you share, who have

their office in New York, you mentioned Mr. Neil as a rate expert. A. Yes.

Q. Did you mention him? A. Yes.

Q. Is he an outstanding man in that field? A. He is very outstanding.

Q. Has he devoted any substantial part of his time to The Cleveland Electric Illuminating Company in the last few years? A. Yes. He has devoted—every time that we have proposed rate reductions or rate changes, we have con-
2465 sulted with Mr. Neil, and in most cases he has come out to Cleveland and spent a week or a month, as the case may be, and in connection with this recent rate case and this compromise settlement Mr. Neil was in Cleveland, I should say for four or five months, continuously, lived in Cleveland, and working on the ramifications of those rate changes.

Q. In order to clear the record, the 1935 financing which you were asked about on cross-examination included two

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separate transactions which occurred at different times? A.
2466 Yes. The bond operation came first and was followed by the preferred stock operation.

Q. In testifying as to the cost of these employees in New York, you said that the amount was approximately 20 thousand dollars for 1939.

In so testifying you meant that that included all expenses of any kind, did you not? A. That is right. The salaries, rent, and petty expense.

Q. Miscellaneous disbursements of any kind? A. Yes, of any kind.

Q. You were asked questions regarding your counsel on the recent financing, and you named two individual lawyers, one in Sullivan and Cromwell and one in Squire, Sanders and Dempsey. Did you mean to imply that they were the only lawyers in those firms that were on that financing? A. No, I didn't mean to imply that. A number of attorneys in Sullivan and Cromwell, and at least three in Squire, Sanders and Dempsey were working day and night on that program. I don't know how many in Sullivan and Cromwell, because the work was done in New York, but I know at least three 2468
attorneys in the firm of Squire, Sanders & Dempsey that worked, worked continually on that, both in New York and Cleveland.

Mr. Browning: That is all.

(Whereupon a recess was taken.)

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The Examiner: You may proceed.

Mr. Browning: Mr. Examiner, we request an adjournment at this time of three weeks, to September 9, at which time we will expect to proceed with the 2469
presentation of evidence regarding the Wisconsin subsidiaries.

Mr. Binford: It is my understanding that beginning September 9 counsel for Respondents will be able to present continuously the evidence they wish to present with regard to the Wisconsin subsidiaries, and that thereafter, although some recess may be requested, it will be one of less duration than that now sought before going on with the St. Louis properties.

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If that understanding is correct, I have no objection to the granting of the recess requested.

Mr. Browning: That is correct.

The Examiner: Very well, with that understanding the matter is now continued until ten o'clock a. m., **September 9.**

(Whereupon, at 3:35 o'clock p. m., the hearing was adjourned to reconvene on Monday, September
2471 9, 1940, at 10:00 a. m.)

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2472

BEFORE THE 2473

Securities and Exchange Commission

File No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.* 2474

Hearing Room 1102,
Securities and Exchange Commission Building
Monday, September 9, 1940.
Washington, D. C.

Met, pursuant to adjournment, at 10:00 o'clock a. m. 2475

Before: W. W. SWIFT, *Trial Examiner.*

Appearances:

CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, Attorney for the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will be resumed.

Mr. Hamilton: Mr. Schmidtman.

EDWARD H. SCHMIDTMAN being called as a witness on behalf of the Respondents, being first duly sworn, was examined and testified as follows:

2477 *By Mr. Hamilton*:

Q. Will you give your name to the reporter? A. Edward H. Schmidtman, S-c-h-m-i-d-t-m-a-n.

Q. And your address? A. 8283 North Gray Log Lane, Milwaukee, Wisconsin.

Q. Are you connected with Wisconsin Electric Power Company? A. I am.

Q. In what capacity? A. I am a member of the department known as the Operating Research Bureau.

Q. And for how long a period have you been connected with them? A. I have been employed by Wisconsin Electric

2478 Power Company and in that department for fourteen years.

Q. And does the Operating Research Bureau perform services for Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company in addition to Wisconsin Electric Power Company? A. Yes, it does. The department is

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a branch of Wisconsin Electric Power Company but it performs services for Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company as well.

Q. Now, will you explain what the function of the Operating Research Bureau is with respect to each of the three named companies? A. The function of the department

is to make general investigations and reports on all phases of operation of the properties of the three companies.

Q. Are you familiar with the territories served by the three companies named? A. Yes, I am. I have been over the territories of all three companies on various occasions in connection with the investigations we have made.

Q. Are you familiar with the operations of the three companies and with the problems arising therefrom? A. Yes, I am. In connection with the work done by our department, I have participated in investigations of various types 2480
for all three of the companies.

Q. Is the Operating Research Bureau at all times available for service—for study, investigation and research into problems of Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company? A. Yes, it is. That is, the function of the department is to serve all three of the

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companies of the Wisconsin Michigan group rather than any one in particular.

Q. Will you now explain your professional training, 2481
Mr. Schmidtman? A. I was graduated from the University of Washington in Seattle in 1923 with the degree of Bachelor of Science in Civil Engineering. I then went to Iowa State College at Ames, Iowa, where, for three years, I served as graduate assistant and instructor in civil engineering.

During that time I completed the requirements for a master's degree in civil engineering. At the end of the first two years I had received that degree at that time. During the third year of my stay at Ames at Iowa State College, I was full time instructor in civil engineering, instructing in general civil engineering courses including hydro-electric engineering and other engineering topics.

At the same time, during my third year there, I carried additional courses sufficient to complete the requirements for a Bachelor of Science in Electrical Engineering, which degree I received in the Spring of 1926.

I would like to continue that statement. I went with Wisconsin Electric Power Company in 1926. Between that time and 1931, I prepared a thesis for professional degree at Iowa State College which I received in 1931. That is the professional degree of civil engineer. My thesis was a
2483 report on an investigation of developing a water power site

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which Wisconsin Michigan Power Company owned in upper Michigan.

Q. Are you a registered professional engineer in Wisconsin? A. Yes, I am. I originally registered as civil engineer when the law for registration of civil engineers was passed. The law was subsequently changed to include all engineers under the general classification of professional engineer so my registration was automatically changed from that of civil engineer to that of professional engineer, which
2484 my present certificate specifies.

Q. Have you participated in a state-wide power survey in Wisconsin? A. Yes, I did. In 1937, the Wisconsin Utilities Association, which is an organization of electric utility companies in Wisconsin, appointed a committee for the purpose of making a state-wide survey of all power generation and transmission facilities in the state.

That survey was made very largely in the department in which I am employed. We had assistance from engineers representing other companies, but most of the work was done in our department. I participated extensively in that work.

In 1940, the spring of this year, the report of 1937 was brought up to date—that is, to the end of 1939—and that

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supplemental report was made under my direct supervision.

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Q. Have you personally participated in conferences and negotiations with representatives of the Public Service Commission of Wisconsin with regard to regulatory matters? A. Yes, I have, on numerous occasions. I have conferred with Commission representatives on matters concerning electric rates, property accounting, service matters, intercompany agreements for services and rental of property and numerous other general topics of discussion between Com- 2486
mission engineers and company engineers.

Q. Now, in order that we may make clear in your testimony the names of the companies with which you are dealing, will you indicate the names of the companies comprising the so-called Wisconsin Michigan group of North American subsidiaries? A. The Wisconsin Michigan group of North American subsidiaries includes four operating companies—Wisconsin Electric Power Company, by which I am employed, Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company, these three being operating electric and gas utilities. 2487

The fourth company in the group is the Milwaukee Electric Railway and Transport Company which is a wholly owned subsidiary of Wisconsin Electric Power Company.

Q. Is that company solely a transportation subsidiary? A. Yes. The Transport Company is engaged solely in the operation of the transportation system in Milwaukee and

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an interurban system of lines to neighboring cities.

It also operates gasoline and trolley busses in the city of Milwaukee.

Q. Was the name of the present Wisconsin Electric Power Company formerly the Milwaukee Electric Railway

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& Light Company? A. Yes, it was. Prior to October 21, 1938, Wisconsin Electric Power Company was known as the Milwaukee Electric Railway & Light Company.

At that time, the transportation business now conducted by the Milwaukee Electric Railway and Transport Company was conducted by the Milwaukee Electric Railway & Light Company along with the electric business.

On that date, however, the Wisconsin Electric Power Company, a former company under that name which owned
2489 a power plant that was leased to the Milwaukee Electric Railway & Light Company, was merged into the latter company and the name was changed to Wisconsin Electric Power Company and the transportation business was separated under the name of the Milwaukee Electric Railway and Transport Company.

Mr. Hamilton: May this map be marked as Respondents' Exhibit No. 32 for identification?

The Examiner: Yes.

(The map referred to was marked for identifi-
2490 cation as Respondents' Exhibit No. 32.)

—1,207—

By Mr. Hamilton:

Q. Will you explain, Mr. Schmidtman, what Respondents' Exhibit No. 32 for identification portrays? A. Exhibit No. 32 is a blueprint map showing the electric service area of the three companies of the Wisconsin Michigan group and also showing the electric production and transmission facilities employed in serving that area.

Q. Has this map been prepared under your supervision? A. It has.

Q. Are the facts shown with respect to the electric systems and service areas of the respective companies taken from the records of the respective companies stated on the map? A. Yes, they were taken from those records.

Mr. Hamilton: I offer it in evidence as Respondents' Exhibit No. 32.

Mr. Binford: No objection.

The Examiner: It may be received under that exhibit number. 2492

(The map referred to was received in evidence as Respondents' Exhibit No. 32.)

By Mr. Hamilton:

Q. Will you now explain, Mr. Schmidtman, the legend which appears in the lower right-hand corner of Exhibit No. 32? A. As indicated by the title of the map, this exhibit

—1,298—

covers the systems and electric service area of Wisconsin Electric Power Company, Wisconsin Gas & Electric Company, and Wisconsin Michigan Power Company.

Communities in which the companies render service directly to customers—by that I mean retail service—are indicated by the open circle. The symbol constituting a circle with a cross inside, designated as communities served wholesale, indicates communities to which the companies sell electrical energy at wholesale rates for distribution by municipal distribution systems in those communities. 2493

The circle containing the large dot in the center indicates communities within the general area covered by the map which are not served from the systems of the companies, either wholesale or retail.

The open square with the vertical bar designates a steam power plant.

Q. And the ownership of those plants may be taken to be, may they not, the company in whose service area the particular symbol appears? A. Yes, that is correct. We have shown, for example, steam power plants in the vicinity of Milwaukee. There are several such plants shown there and those plants, being within the area served by Wisconsin Electric Power Company, are owned by that company.

Those are the only steam plants on the entire map. There

—1,209—

2495 is a combination steam and hydro-electric plant at Appleton, designated by a square with a horizontal and vertical bar. The hydro-electric power plants, mostly located in the northern portion of the service area of the companies, are designated by open squares containing a horizontal bar.

The open triangle represents an electric sub-station. Some of these sub-stations are classified in our property account as distribution stations.

We didn't follow the accounting classification in determining which sub-stations we should show on the map; rather, we selected the sub-stations of major importance—
2496 those above the very smallest have been shown here as an indication of the extent to which sub-stations have been provided to serve the areas.

Q. So that all sub-stations are not actually shown on the map but only the more important sub-stations? A. That is correct. The symbol representing a gas plant is an open square. Those are found at Appleton and in the territory served by Wisconsin Gas & Electric Company.

Q. And by "gas plant" you refer to a gas manufacturing plant? A. Yes, a plant where gas is manufactured. There are two kinds within the properties of these companies—the type of plant that manufactures coke gas and the type that manufactures water gas.

—1,210—

Gas holders are indicated by a cross or a square with a diagonal cross in it. Points of interconnection between the systems of the three companies and between any one of the three companies and other utility systems are shown by two short parallel lines drawn across the transmission line at the point of interconnection.

Where the interconnections are between the properties of two of the companies of the group, the change in ownership is designated by the color of the lines which I will explain in a moment. 2498

Where the interconnection is between one of the companies of the group and some non-affiliated electric utility, such as Wisconsin Power & Light Company, shown near the bottom of the map in Walworth and Rock Counties, the map will indicate the name of the non-affiliated utility with which the interconnection exists.

The ownership of the electric power lines is shown by coloring, the lines of Wisconsin Electric Power Company being colored red, those of Wisconsin Gas & Electric Company being colored yellow and those of Wisconsin Michigan Power Company being left in white. 2499

Q. Will you explain now the basis which has been adopted in showing electric power lines? In other words, above what voltage have you taken lines? A. As in the case of the substations, we have shown on this map the principal lines of

—1,211—

the company with the thought that we wanted the map to picture the extent to which these principal lines cover the territories served by the companies. We didn't follow a voltage designation strictly, although I can say that all lines of 132,000 volts, 66,000 volts, and 33,000 volts are shown on the map.

Some of the 26,400 volt lines owned by the companies are shown, some of the 13,800 volt lines are shown, and in a few instances where communities are served by lines of voltage below 13,800, we have shown lines that operate at primary voltage of 4,800 volts.

Q. No lines are shown of less than 4,800 volts? A. No.

Q. Can you state the basis for exclusion or inclusion of lines shown between 4,800 volts and 33,000 volts? A. Do you mean—yes, I can state that. Those lines below 33,000
2501 volts which are classified as transmission in our classification of property, are all shown.

Q. I see. A. And some lines below 33,000 volts—that is, those which are in the distribution class—are shown because they take service to communities which we felt were important enough to show on the map. That is, we didn't think it would be very informative to show a community served without a line connecting to it.

—1,212—

Q. So that if you added to the map any lines which may exist of less than 4,800 volts, and distribution lines in excess
2502 of 4,800 and up to 33,000 volts, you would have a substantial number of lines in addition to those shown, is that right? A. Yes, we would have so many lines that I doubt that there would be room on the map to put them all on in the more heavily served areas.

The gas properties of Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company are shown by the symbols indicated in the legend. The gas transmission lines are represented by short dashes, those of Wisconsin Gas & Electric Company being colored yellow and those of Wisconsin Michigan Power Company being left in white.

Q. Are all gas transmission lines shown? A. Yes, all of them owned by either or both of these two companies are

shown. The electric service areas as indicated by the legend are shown by the diagonal lines or crosshatching. The symbol indicates which company serves each area.

Q. Will you now show us on Exhibit No. 32 the course of the Michigan and Illinois State lines? A. Yes. The Wisconsin-Illinois State line lies along the bottom of the map and it terminates the territory of Wisconsin Gas & Electric Company in Kenosha County.

—1,213—

The Wisconsin-Michigan boundary line enters the map
near the upper left corner. It is the heavy dash and dot 2504
line which is straight for a section and then it becomes rather twisting. This curved portion of the boundary line represents the Brule River and the Menominee River, the lower section being the Menominee River which flows into Green Bay.

There is one point just above the final "N" in the word Wisconsin, where the word Menominee appears. The draftsman shifted that word a little too far to the left where the name Menominee appears.

The word Menominee County is in Michigan and that
word should be entirely on the right-hand side of the river. 2505

Q. Before going into any detailed description of the respective service areas, would you give us a general description so that it may be clear, particularly where service areas are adjacent, which company serves the particular territory? A. The combined territories of Wisconsin Electric Power Company and Wisconsin Gas & Electric Company occupy an area of 4029 square miles in the southeastern portion of the State of Wisconsin. This area includes the principal industrial districts of the State and also includes what might be termed one of the richest portions of the agricultural sections in the State of Wisconsin.

As can be seen from the map, the general shape of the

—1,214—

combined territories of these two companies is that of a rough semi-circle with its diameter lying along the west shore of Lake Michigan. The territory begins on the south at the Illinois boundary line and extends north about ninety miles along the shore of the lake.

The most westerly point is about sixty miles west from Lake Michigan at Milwaukee. This area includes the prin-
2507 cipal cities of Milwaukee, Racine, and Kenosha, which are the industrial centers of the entire district.

The other portions of the service area of these three companies are served by Wisconsin Michigan Power Company. One of them referred to as the southern division of that company lies in the vicinity of Appleton.

It extends about ten miles south, from Appleton along both shores of Lake Winnebago, west about forty miles, north about fifty, and east about ten miles from Appleton. This division includes a highly industrialized section of the
2508 lower Fox River Valley near Appleton, and a rich agricultural area lying to the north and to the west.

The northern portion of the service area of Wisconsin Michigan Power Company is located in northeastern Wisconsin and the upper peninsula of Michigan. It lies roughly parallel to the Wisconsin-Michigan boundary line extending for a length of approximately 120 miles in an easterly and westerly direction and has an average width of about sixty miles.

—1,215—

The lines surrounding the territory are quite irregular but those are the approximate mean dimensions. This northern portion of the territory includes the City of Iron Moun-

 2509

tain, Michigan, and the cities of Crystal Falls and Iron River.

Q. You might locate those cities on the map. A. Iron Mountain is located in the vicinity of the name of Dickinson County at about the south central portion of the northern territory.

Crystal Falls is northwest from there, diagonally northwest, and is identified by a symbol indicating a community served wholesale.

Iron River is due west from Crystal Falls. At that point 2510
we find a symbol indicating a Diesel engine generating station. At Iron River the system of Wisconsin Michigan Power Company interconnects with that of Iron Range Light & Power Company.

The northern territory includes, in addition to these cities, a fairly active—in fact, a very active at present—iron mining district in the vicinity of Iron Mountain, Crystal Falls and Iron River.

The northern territory also includes portions of Schoolcraft and Delta Counties located on the eastern end of the 2511
Michigan area.

The business done in that district is a small portion of the total business of the company inasmuch as the company serves only about 315 customers in that district who, in

—1,216—

1939, consumed 228,000 kilowatt hours from which the company received gross revenue of about $12,500.00.

The company operates another short section of line which is detached from the main system of the company. This section is located in Marquette County and will be found on the map above the letter "A" in the word "Michigan".

Energy distributed on this line is purchased from Cliffs Power & Light Company, as is the energy distributed on the line in Schoolcraft County.

Q. Cliffs Power & Light Company is a non-affiliated company? A. Yes, it is non-affiliated.

Wisconsin Michigan Power Company serves 470 customers from this short section of line in Marquette County, who, in 1939, purchased 370,000 kilowatt hours for which they paid a gross revenue of $17,600.00.

2513 The combined sales on these two short sections of detached line in 1939 amounted to three-tenths of one per cent. of the total kilowatt hours sold by Wisconsin Michigan Power Company and produced revenues amounting to nine-tenths of one per cent. of the total revenue of the company.

Q. That again is a gross revenue figure, is it? A. Gross revenue, yes, and per cent. of the gross revenue.

Q. What is the population density of the territory of the three companies? A. The population density of the terri-

—1,217—

tories served by the three companies varies rather widely.
2514 Wisconsin Electric Power Company renders service in an area covering 867 square miles. In that area, the company serves a population of 873,500. The average density of that population in that area is slightly over 1,000 per square mile.

Wisconsin Gas & Electric Company, which serves the territory immediately adjacent to and completely surrounding the territory served by Wisconsin Electric Power Company, serves a population of 231,818. The area is 3,162 square miles and the average density of population is approximately 73 per square mile.

Wisconsin Michigan Power Company serves a population of 104,300 in the southern portion of its territory which has an area—correction—in the Wisconsin portion of its terri-

tory including the section around Appleton as well as the area served in northern Wisconsin.

The Witness: Will you read my answer to me, please?

(Whereupon the answer above recorded was read by the reporter.)

The Witness: This territory has an area of 2,508 square miles.

By Mr. Hamilton: 2516

Q That being the entire territory served by Wisconsin Michigan Power Company in Wisconsin? A. Yes, that is

what it is. That is the entire Wisconsin territory of Wisconsin Michigan Power Company.

Q. In Wisconsin. A. The density of population in that area is approximately 42 per square mile.

The Michigan territory served by Wisconsin Michigan Power Company covers an area of 5,781 square miles in which the company serves a population of 65,500. This gives an average population density of only 11 per square mile. The 2517 total territory served by Wisconsin Michigan Power Company in both Wisconsin and Michigan has an area of 8,289 square miles and in that area the company serves a population of 169,800.

These figures show that the average population density of all territories served by Wisconsin Michigan Power Company in both states is only 20 per square mile which is a relatively low population saturation.

Now, summarizing for the three systems as a whole, we find that the companies are serving a population of 1,275,000 in a total area of 12,318 square miles, giving an average density of population of 104 per square mile.

2518 *Edward H. Schmidtman—By Respondents—Direct*

Q. What is the relation of the territories served by the companies to the entire square mileage of Wisconsin? A. The companies serve a total of 6,537 square miles in Wisconsin alone. The area of Wisconsin is 55,256 square miles.

—1,219—

That would indicate that the companies are serving somewhere in the neighborhood of 12 per cent. of the total area of the State of Wisconsin.

The population served in that area is 1,209,600. The
2519 1940 population of Wisconsin was reported to be 3,125,000. From these figures we can see that the companies are serving slightly less than 40 per cent. of the total population of Wisconsin.

Q. Mr. Schmidtman, in indicating the population served, you are not purporting to indicate the number of customers served but rather the total number of persons residing in the territory indicated, isn't that true? A. No, not exactly. When I state "population served" I mean the population of the areas including communities in which the companies render electric service.

2520 To elaborate a little, the territory of Wisconsin Gas & Electric Company includes the Village of Slinger, which can be found on the map to the right and slightly below the name of Dodge County. It is indicated by a circle containing a cross which means the company sells energy wholesale to that community.

The population of that community is not included in the figures I have given as population served by the company because that population is served by the municipal utility which operates in that municipality.

—1,220—

In the case of Hartford, which is located to the left and slightly below Slinger, the company likewise does not render

service in that area and so the population of that area has not been included in our figures.

With respect to the distinction between population and customers, however, the answer to your question is yes. These figures do not indicate the number of customers on our systems. They indicate simply the number of people residing in the areas where the three companies of the Wisconsin-Michigan group actually render service.

Does that answer the question suitably?

Q. Yes. These figures again are solely for electric service, 2522
are they not? A. Yes.

Q. They don't purport to take in gas? A. They apply to electric service only.

Q. How many communities are served by the three companies? A. The three companies render electric service in a total of 388 communities in the states of Wisconsin and Michigan.

Q. And how is that figure divided between the companies? A. Wisconsin Electric Power Company renders electric serv-
ice in 64 communities. These 64 comprise seven cities, nine- 2523
teen villages, and thirty-eight townships which are unincor-

—1,221—

porated.

Wisconsin Gas & Electric Company renders electric service in a total of 170 communities, including seven cities, forty villages, and 123 townships.

Wisconsin Michigan Power Company renders electric service in 94 communities in Wisconsin and 60 communities in Michigan. The Wisconsin communities include three cities, fourteen villages, and 77 townships, while the Michigan communities served include three cities, six villages and fifty-one townships.

The make-up of the total of 154 communities served by Wisconsin Michigan Power Company is six cities, twenty villages and 128 townships

The three companies together serve electric customers in twenty cities, 79 villages and 289 townships, making the total of 388 I gave you before.

Q. These communities to which you have referred are located in how many counties? A. They are located in a total of thirty-seven counties, of which twenty-six are in
2525 Wisconsin and eleven are in Michigan.

Among the more important counties included in the service area of the three companies are Milwaukee, Racine, Kenosha, and Waukesha Counties, in Wisconsin, which are the more heavily populated counties in the combined territories of Wisconsin Electric Power Company and Wisconsin Gas & Electric Company and Outagamie County, Wisconsin,

—1,222—

and Dickinson and Iron Counties, Michigan, which are served by Wisconsin Michigan Power Company.

2526 Other counties in which the population is not so heavy but in which substantial service is rendered are Ozaukee, Washington, Jefferson and Walworth in Wisconsin, and Waupaca and Oconto Counties, also in Wisconsin. The other counties served in Michigan are not heavily populated.

(Discussion off the record.)

By Mr. Hamilton:

Q. In order to get an idea as to the relative importance of the communities served population-wise, would you indicate the communities served by Wisconsin Michigan Power Company having a population of an excess of 2000 persons? A. Of the twenty-six incorporated communities—that is,

cities and villages—served by Wisconsin Michigan Power Company in Wisconsin and Michigan, six have a population of 2000 or more. Of these six, four are cities and two are villages.

The largest of these is the City of Appleton, Wisconsin, in which the—in and around which the principal industrial business of Wisconsin Michigan Power Company is conducted.

Q. What is the population of Appleton? A. The population of Appleton is 28,458. Appleton is the principal city 2528

—1,223—

served by Wisconsin Michigan Power Company. It is a residential city and is also the center of a very active industrial area in the Fox River Valley.

Lawrence College and the Institute of Paper Chemistry are located there. The Institute of Paper Chemistry is a research institution endowed by the paper industry. It is not conducted as an educational institution for the public, but is sort of a research foundation in which new processes and new products related to the paper-making industry are
developed. Some of the finest paper chemists in the country 2529
have had their training and are improving their training in this institute.

Among the industries in and around Appleton, the principal ones are paper mills and other industries related to the manufacture of paper and paper products. Other factories in the area produce knit goods, among which are goods for personal wear as well as the knitting of wool blankets which are used in the manufacture of paper.

It is a very precise operation; a very high-grade product is required to serve this use.

Other industries in Appleton produce agricultural implements, toys and various products of wooden ware.

There is a brewery located at Appleton and also a large milk condensery.

Appleton is a natural industrial center for this section

—1,224—

of the state because of the presence of available water power in the Fox River. The early industries which settled in Appleton utilized this water power entirely for their manufacturing operations—that is, for their power requirements —and many of those industries still make extensive use of
2531 the water power in the Fox River, but industrial loads in the area in general have far outgrown the amount of power available from the River, and so many of the industries—most of them, in fact—purchase substantial quantities of power from Wisconsin Michigan Power Company.

The next largest city served by Wisconsin Michigan Power Company is Neenah—N-e-e-n-a-h—which is located on the shore of Lake Winnebago a few mlies south and west of Appleton.

Neenah has a population of 10,642. This city is located at the point where the Fox River flows from Lake Winnebago
2532 and, as was the case in Appleton, Neenah also has fairly large amounts of water power available from the Fox River. The United States Government owns and operates a dam across the Fox River at Neenah which is operated for the purpose of regulating the discharge from Lake Winnebago in using it as a storage reservoir to maintain navigable flows of water in the Fox River.

The Fox River is a navigable stream and considerable shipping is done on it from Green Bay up into Lake Winnebago and to the cities located on Lake Winnebago.

—1,225—

The principal industries in Neenah also relate to the manufacture of paper and various paper products.

Iron Mountain, Michigan is the principal city served by Wisconsin Michigan Power Company in the State of Michigan. It has a population of 11,500. It is located in the Menominee iron range.

I spoke a while ago of the iron mining activities in the portion of the Michigan territory lying along the Wisconsin boundary. On of the active areas in this iron range is in the immediate vicinity of Iron Mountain.

The other industries in Iron Mountain are saw mills and smaller industries producing wood products. 2534

Kingsford, Michigan, is a village which is largely a residential suburb of Iron Mountain and is located immediately at the south limits of Iron Mountain. Kingsford has not been shown on the map. We regard Kingsford and Iron Mountain in an operating sense as one combined community, but in discussing them, for the purposes of des ibing the territory served, we have taken it up separately in order to tell of its characteristics.

Kingsford has a population of 6500. Its only major industry is a saw mill and a plant of the Ford Motor Company where station wagon bodies are made. These bodies are 2535 made of wood and the plant is located here to utilize the wood available in the surrounding territory.

—1,226—

The next larger community served by Wisconsin Michigan Power Company is Kimberly, Wisconsin, which is located on the Fox River, a few miles downstream from Appleton. It appears on the map.

Kimberly has a population of 2700. It is a residential suburb of Appleton. A large paper mill of the Kimberly-Clark Corporation is located in Kimberly, utilizing the water power from the Fox River in carrying on its paper manufacturing operations.

Large quantities of wood are ground into pulp at this plant and the plant produces papers of various quality. The Kimberly-Clark Corporation has generally specialized in the manufacture of high quality papers—bond and paper for accounting forms, and paper used in the rotogravure sections of the Sunday newspapers. They are a very progressive corporation and one of the largest customers of Wisconsin Michigan Power Company.

Mr. Hamilton: Off the record.

2537 (Discussion off the record.)

The Witness: Niagara, Wisconsin, a village of 2100 population, is served by Wisconsin Michigan Power Company. Niagara is located just south of the Michigan boundary and can be found on the map by following the high voltage transmission line vertically to the point where it strikes the Michigan boundary,

—1,227—

then immediately to the left you will find Niagara.

It is indicated as a community served by the company and also is a point of interconnection between
2538 the system of Wisconsin Michigan Power Company and a plant of Kimberly-Clark Company.

Niagara is largely a residential community, but has the one principal industry—the Kimberly-Clark Paper Mill. The mill is constructed at Little Quinnesee Falls—Q-u-i-n-n-e-s-e-e—on the Menominee River.

That is one of the major falls in the stream and is a site of substantial water power capacity. The Kimberly-Clark mill utilizes the power in the river at that point in operating its mill, and as will be pointed out later, the interconnection with Wisconsin Michigan

 2539

Power Company permits it to dispose of surplus energy from the plant and to obtain firm power during periods of deficiency in their own source.

By Mr. Hamilton:

Q. Does Wisconsin Michigan Power Company serve a large rural area as well? A. It does, yes. The area surrounding Appleton and reaching to the north and the west is very largely rural. The communities located within that area are relatively small and the principal activity as well 2540
as the principal income of the district relate to agricultural pursuits.

—1,228—

This area produces large numbers of hogs and in that connection the farmers raise large crops of grain and also have dairy herds, produce dairy products, and various products related to dairying, largely for feed.

There is some truck farming also in the immediate vicinity of Appelton to the north and somewhat to the west. Various vegetables that thrive on relatively short seasons are produced there in great quantities. 2541

In the northern portion of the territory of Wisconsin Michigan Power Company lying in northern Wisconsin and in Michigan, there are large rural areas lying between the scattered urban centers. In these rural areas are wide stretches of forest land, the best timber having been removed during the years of the logging boom in Wisconsin and Michigan, and the timber now standing being made up now largely of second growth soft wood, poplar and basswood, quick growing soft-wood trees of that general character.

Some of the area in that district is still covered with original stands of hardwood—hickory, maple and oak.

Q. Does Wisconsin Michigan Power Company serve all the incorporated communities within its territory? A. Yes, it does. It does with the exception of those served by municipal utilities. By that I mean aside from the municipal utilities there are no incorporated communities served within the territory. —1,229—

Now, those municipal electric systems are operated in eight municipalities. Menasha, which is located immediately across the river from Neenah on Lake Winnebago right at the
2543 northern tip of Lake Winnebago, operates one of these municipal electric utilities.

The Menasha system serves about 3,100 electric customers. Menasha has a population of 10,900. The energy which is distributed on the Menasha municipal system is generated very largely in an internal combustion generating station operated by the city.

That station has a capacity of 2,500 kilowatts. The plant is of insufficient capacity, however, to carry all of the loads served by the municipal utility, and it has been necessary from time to time for the city to purchase supplemental
2544 power from Wisconsin Michigan Power Company to make up for the deficiency ~~in~~ its own plant.

That is, the load has grown beyond the ability of the plant to carry it and the municipal system is connected with that of Wisconsin Michigan Power Company.

—1,230—

The plant, being of limited capacity, is also unable to serve all of the industrial loads within the city and for that reason for a number of years Wisconsin Michigan Power Company has served all of the large industrial power loads located within the city, in addition to supplying supplemental energy to the municipal system for distribution to its customers.

During the year 1939 Wisconsin Michigan Power Company delivered 2,913,600 k. w. h. of electrical energy to the municipal sysem. That isn't a very large quantity of energy but it is always taken at a time when the municipal plant is in need of additional capacity and is considered firm energy of the highest type.

By Mr. Hamilton:

Q. That figure is exclusive of sales which you make direct to large industrial users in the city? A. Yes, that is true. 2546

Another municipality in this district is operated by the city of Kaukauna. Kaukauna is also located on the Fox River, but is downstream from Appleton. It appears in the open space on the map, immediately to the right of Appleton. It is indicated by a symbol which shows that energy is sold to the city by Wisconsin Michigan Power Company at wholesale.

There is also a symbol showing an interconnection between the electric system of Wisconsin Michigan Power Company and the electric system operated by the city of Kaukauna. 2547

—1,231—

Q. And what is the population of Kaukauna? A. Kaukauna has a population of 7,200 and the municipal utility renders service to approximately 3,100 customers.

Kaukauna operates two hydroelectric stations on the Fox River. At this point I think I should explain that the United States Government operates navigation dams on the Fox River for the purpose of maintaining navigable depths of water in the river and in canals paralleling the river between the dams and locks. There is more than enough water flowing in the stream under normal stream flow conditions to furnish the needs for these navigation purposes and the right

to utilize the power at the Government dams represented by that excess flow is owned by Green Bay and Mississippi Canal Company, which, through a long history, came into the ownership of this water right, that is the right to use the power in flowing water.

Green Bay and Mississippi Canal Company does not own nor operate any water power plants on the river but it leases the water power at the various navigation dams to different users. The city of Kaukauna operates two water power
2549 plants at two of such dams; one is known as the Badger plant, located in the city of Kaukauna, at the Kaukauna dam, and the other is located a short distance downstream, at the Rapide Croche dam.

The city operates the two power plants, paying Green Bay and Mississippi Canal Company annual tolls for the use of the falling water, and uses the output from these plants in operating its municipal electric utility. The two plants pro-

—1,232—

duce more energy at certain seasons of the year than the municipal system is able to utilize in serving its customers,
2550 that is during seasons of average flow and of high flow when the generating units in the plants have enough water to operate at full load they produce more energy than municipal utility requires for its customers.

During those periods, by means of the interconnection with Wisconsin Michigan Power Company, Kaukauna delivers that excess energy into the system of the company. That energy is what we call surplus or dump hydroelectric energy. We call it that because it comes only at the times when streams are in flood, or at the times when the loads on the municipal distribution systems are below the output of the plants.

During other seasons of the year, however, when the stream drops to low flow conditions, the plants do not put out enough energy to carry the needs of the municipal distribution system. At those times the city of Kaukauna purchases energy from Wisconsin Michigan Power Company to make up its own deficiency of supply.

In 1939 the city of Kaukauna sold to Wisconsin Michigan Power Company 4,089,800 k. w. h., and purchased from the company 2,709,000 k. w. h. Kaukauna has several industries, most of which are paper mills or other industries related to 2552
the manufacture of paper products.

Shawano, Wisconsin, located on the eastern edge of Shawano county, in the northwest portion of the southern

—1,233—

area served by Wisconsin Michigan Power Company, also operates a municipal electric distribution system. Do you find it?

Shawano has a population of 4,800. The electric distribution system operated by the city does not include any power generation facilities whatever, all of the power requirements
of the system being purchased from Wisconsin Michigan 2553
Power Company.

In 1939 the municipal electric system purchased 3,796,693 k. w. h. from Wisconsin Michigan Power Company for distribution to about 1,700 customers. Shawano is a trading center for a large rural area devoted principally to dairying and products related to the dairying industry. The area served by Shawano in that respect, lies partly within the territory served by Wisconsin Michigan Power Company and partly outside the territory of the company. The industries located in Shawano consist principally of condensed milk canneries and other milk processing plants.

2554 *Edward H. Schmidtman—By Respondents—Direct*

New London, Wisconsin, which is located in Waupaca county, southwest from Shawano, also operates a municipal electric distribution system. As is the case with Shawano, New London purchases all of its energy requirements from Wisconsin Michigan Power Company and does not operate any power generation facilities. It never has operated any power plant.

The New London system serves about 1,200 customers and in serving these customers it purchased from Wisconsin
2555 Michigan Power Company in 1939, 4,791,966 k. w. h. New

London is largely a residential community in an agricultural area much like Shawano. Its principal industries are a vegetable cannery and a milk condensery. You will notice that in the case of most of these communities in the southern portion of the area served by Wisconsin Michigan Power Company the industries are related to agricultural products showing the agricultural nature of the general area.

Oconto Falls, Wisconsin, which is located in Oconto county about 20 miles west of Green Bay, operates a munici-
2556 pal electric distribution system. This system sells about 400,000 k. w. h. annually to approximately 500 customers. It operates no power generation facilities, purchasing all of its energy requirements from Wisconsin Michigan Power Company. The principal industry at Oconto Falls is a pulp mill, the power loads of which are served directly by Wisconsin Michigan Power Company.

This pulp mill is located on the Oconto River, on which is also located the Oconto Falls hydroelectric plant of Wisconsin Michigan Power Company, indicated by the hydroelectric power plant symbol shown on the map. The pulp mill uses water power from the Oconto River in grinding pulp to the extent that such power is adequate to meet its

needs and power requirements above that are purchased from Wisconsin Michigan Power Company.

The city of Norway, Michigan, located in the open space in the territory served by Wisconsin Michigan Power Company, east of Iron Mountain and lying north of and adjacent

—1,235—

to the Wisconsin-Michigan boundary line, operates an electric distribution system. This system serves approximately 1,200 customers and purchases all of the energy distributed to these customers from Wisconsin Michigan Power Company through the interconnection indicated on the map. 2558

In 1939 Wisconsin Michigan Power Company sold the city of Norway 1,528,674 k. w. h. for distribution on the municipal system.

Q. And its population is what? A. The population of Norway is 3,500. Norway is largely a residential community, to some extent a suburb of Iron Mountain, and is situated in the iron mining district on the southeastern end of the Menominee iron range.

Crystal Falls, Michigan, operates a municipal hydro-electric generating station and distribution system. This 2559
city is located in Iron county east of Iron River, in the area not served by Wisconsin Michigan Power Company.

The city of Crystal Falls generates most of its energy requirements for the distribution system by means of the hydroelectric plant which it operates on the Paint River flowing through the city. Here, again, however, there are times when the plan is capable of generating power faster than the customers of the system need it. During such times the city delivers that surplus energy to the system of Wisconsin Michigan Power Company as dump hydroelectric energy. Likewise there are seasons when the Paint River flow falls

—1,236—

to such a point that there is not sufficient water in the stream to carry the loads of the municipal system and at those times the city buys make-up power from Wisconsin Michigan Power Company.

In 1939 the city sold 595,200 k. w. h. of surplus hydro-electric energy to Wisconsin Michigan Power Company, and purchased 11,400 k.w.h. of firm energy from the company. This exchange of energy is not extensive as indicated by the figures, but it is quite important to the municipal utility to
2561 be able to dispose of the surplus output because if it had no market that power would be wasted in the form of water spilled over the dam and it is likewise important, even more so, to the municipality to be able to purchase firm power during its times of need.

Q. What is the population of Crystal Falls? A. Crystal Falls has a population of 2,600, and the municipal system there serves approximately 900 customers.

Crystal Falls has no major industries within the corporate limits but it lies in the center of a very active section of the iron mining district in the Menominee range. A num-
2562 ber of large scale iron mines operate in the immediate vicinity of Crystal Falls. These mines, however, are outside the area reached by the municipal utility and are served entirely by Wisconsin Michigan Power Company.

The Examiner: Let us have a recess for five minutes.

—1,237—

(Whereupon, after a brief recess the hearing was resumed.)

The Examiner: All right.

 2563

By Mr. Hamilton:

Q. Proceed. A. There is one other electric utility operated by a public body within the territory served by Wisconsin Michigan Power Company. That is the utility operated by the Florence Water and Light Commission, of the Township of Florence. The presence of the system which is served wholesale by Wisconsin Michigan Power Company is designated by the symbol indicating wholesale service at Florence, which is located in Wisconsin, south and a trifle
east of Crystal Falls. 2564

The community of Florence is unincorporated but electric service is rendered in that community and in the neighboring community of Commonwealth by the electric distribution system which is operated by the Township Board of the Township of Florence. This system serves approximately 300 customers, all of the energy distributed being purchased from Wisconsin Michigan Power Company through the interconnection shown on the map.

In 1939 the Florence Water and Light Commission purchased 465,100 k. w. h. from Wisconsin Michigan Power
Company for distribution to its customers. The community 2565
of Florence has a population of 1100. It is located in the general area lying between Iron Mountain and Crystal Falls, and some iron mines operate in the general vicinity. It is a small residential community with no industries directly

—1,238—

inside the community area.

Q. Turning now to Wisconsin Gas & Electric Company, what cities are served with electric service by it in its territory? A. Wisconsin Gas & Electric Company renders electric service in seven cities. The principal city served by the company is Kenosha, which has a population of

48,464. Kenosha is an important city in the industrial area of Wisconsin. It is located seven miles north of the Illinois line and is on the shore of Lake Michigan.

The principal industries operating in Kenosha and served by Wisconsin Gas & Electric Company, are the Nash Kelvinator Corporation which manufactures Nash automobiles in Kenosha; the American Brass Company, which manufactures a large variety of brass and copper products; the MacWhite Company, which manufactures MacWhite wire rope;
2567 the Simmons Manufacturing Company, which produces bed springs and mattresses; Coopers' Incorporated, manufacturing various knit goods; Kenosha Full Fashioned Mills, which also make knit goods; and the Peter Piersch & Company, widely known manufacturers of fire-fighting equipment.

Waukesha, Wisconsin, is also served by Wisconsin Gas & Electric Company. It is located about 14 miles west of Milwaukee, entirely within the area served by Wisconsin Electric Power Company. The territory served in that district by Wisconsin Gas & Electric Company is indicated by
2568 the line enclosing the area cross-hatched with the symbol indicating service area of Wisconsin Gas & Electric Com-

—1,239—

pany.

Waukesha has a population of 19,205. It is a residential and industrial community. Its principal industries include the Waukesha Motor Company which manufactures gasoline engines; the Foxhead Waukesha Corporation, which manufactures beer, soft drinks and bottles and distributes mineral water; the Borden Milk Products Company, which produces various milk products; the Crittal-Federal, Inc., who produce steel sash and other steel products for building construction.

Waukesha is also known for its sanitariums and mud baths. Large quantities of limestone, sand and gravel are produced there. All of these industries, as well as others which I haven't mentioned, are served directly as customers of Wisconsin Gas & Electric Company.

The city of Watertown, with a population of 11,270, is served by Wisconsin Gas & Electric Company. Watertown is located directly on the county line between Dodge and Jefferson counties, and about midway east and west between
the extremes of Dodge county. It is 45 miles north and 2570
west of Milwaukee.

Watertown is largely residential in nature but has a few industries, among which are the Village Blacksmith Folks, manufacturers of a well-known line of cutlery; the Walter Booth Shoe Company is located there, as well as three large dairies and several manufacturers of wood specialties.

Fort Atkinson, which is situated in the southern portion

—1,240—

of Jefferson county, has a population of 6,140. Electric service is rendered there by Wisconsin Gas & Electric Com-
pany. In addition to being a residential center for a large 2571
agricultural area, Fort Atkinson has several dairy products plants which produce cheese and butter. It also has a knitting mill and two plants which manufacture various types of farm equipment.

West Bend is also served by Wisconsin Gas & Electric Company. It is located due west from Port Washington which is on the shore of the lake, 25 miles north of Milwaukee.

West Bend and its suburb, the village of Barton, constitute a very active industrial and residential community.

The Amity Leather Company, manufacturers of a wide line of leather goods; the Enger-Kress Company, which also manufactures leather goods; and the West Bend Aluminum Company, are located in West Bend. Other industries in West Bend and Barton which are usually considered as one center, include brewing and malting, stone quarrying, the manufacture of knit goods, automobile accessories, electrical equipment, laundry equipment, and dairy products.

Q. Have you given the population of West Bend? A.
2573 The population of West Bend is 5,456.

Wisconsin Gas & Electric Company also renders electric service in the city of Burlington which is located in the southwest corner of Racine county. Burlington has a population of 4,111. It is principally a residential community, surrounded by an agricultural and summer resort area. Its principal industries include a brewery, a brass foundry, and

—1,241—

an ice cream factory. A considerable amount of business is done in Burlington by people who go to that area to visit the resorts on the lakes. Because of that fact the electrical
2574 sales in Burlington do not show the usual seasonal decline in summer that is shown by sales in many communities.

Whitewater, which is located in the northwest corner of Walworth county, has a population of 3,679. It is a residential community which serves as a trading area for a rural district surrounding it. Its major industries are a brewery and a dairy products plant.

Q. Are there municipal electric utilities located in the territory served by Wisconsin Gas & Electric Company? A. Yes, there are. There are nine such municipal electric utilities within the territory served by Wisconsin Gas &

Electric Company. Of these nine, six of them purchase their total energy requirements from Wisconsin Gas & Electric Company and three generate power. Of those which purchase their entire requirements from Wisconsin Gas & Electric Company, Elkhorn is one.

Elkhorn is located at about the center of Walworth county. As indicated by the map, its system is interconnected with that of Wisconsin Gas & Electric Company and power is sold at wholesale to the city for distribution to its customers. The municipal system operated by the city of 2576
Elkhorn serves approximately 1,000 customers and in 1939 the city purchased 3,086,400 k. w. h. from the company in

serving those customers.

Elkhorn is also located in the same general resort area in which Burlington is situated and has a considerable residential population. Its industries are generally associated with dairying, a large plant of United Milk Products being located there.

Q. What is the population? A. The population of Elkhorn is 2,700. 2577

Another city operating a municipal utility, located within the territory of Wisconsin Gas & Electric Company, is the one at Jefferson, Wisconsin. Jefferson has a population of 2,700. The municipal utility operated by the city of Jefferson purchases its entire power requirements from Wisconsin Gas & Electric Company, taking 3,256,320 k. w. h. from the company in 1939. This energy was distributed to about 1,100 customers.

The community is largely residential but has one major industry which is a plant of the Copeland Ryder Shoe Company.

2578 *Edward H. Schmidtman—By Respondents—Direct*

I did not locate Jefferson for you on the map. It is in Jefferson county, slightly west of the center of the county.

A municipal utility is operated by the village of Kiel, Wisconsin, which is located at the northern edge of the territory served by Wisconsin Gas & Electric Company. The village is shown on the map at the line between Manitowoc and Calumet counties, near the southwest corner of Manitowoc county.

Kiel has a population of 2,000. The municipal distribu-
2579 tion system serves approximately 800 customers and in 1939 it purchased 1,295,200 kilowatt hours from Wisconsin Gas

—1,243—

& Electric Company for distribution to its customers.

The principal industry located in Kiel is the factory of the Kiel Furniture Company. The village of Kiel is not located strictly within the confines of the territory served by Wisconsin Gas & Electric Company, but we have shown it as one of the communities to which the company renders electric service at wholesale.

The village of Deerfield, Wisconsin, is located in the west-
2580 ern tip of the territory of Wisconsin Gas & Electric Company, in Dane County. It has a population of about 400. It is a residential village with vegetable canning plants located in the country-side around the village.

The municipal distribution system operating there serves about 200 customers and its entire power requirements, which were purchased from Wisconsin Gas & Electric Company in 1939, amounted to 887,000 kilowatt hours.

The Village of Slinger, with a population of 800, also purchases energy from Wisconsin Gas & Electric Company for distribution on a municipal electric system.

Slinger is located near the center of Washington County. The municipal system of the village serves about 200 customers and purchased 689,760 kilowatt hours from Wisconsin Gas & Electric Company for distribution in 1939.

(Discussion off the record.)

—1,244—

The Examiner: Back on the record

Mr. Hamilton: Will you read the last statement by the witness? 2582

(Whereupon the last above statement was read by the reporter.)

The Witness: There are no industries worthy of note in the village of Slinger, but the village derives its principal business from the resort area in which it lies.

Wisconsin Gas & Electric Company sells electrical energy at wholesale to the municipal utility operated by Waterloo, Wisconsin. Waterloo has a population of 1300 and is located in the northwest corner of Jefferson County. The municipal system in that community serves approximately 500 customers, and in 1939 it purchased 1,848,938 kilowatt hours from Wisconsin Gas & Electric Company. 2583

The municipal utility purchases its entire energy requirements from the company. Waterloo is a residential community deriving some business from the surrounding agricultural and resort district.

Three of the municipal electric utilities operating within the territory served by Wisconsin Gas & Electric Company generate their own power.

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One of these is that at Cedarburg, which appears on the map south and west from Port Washington. It is designated by a symbol which indicates a community not served from the system of any of the companies.

—1,245—

Cedarburg has a population of 2300. The munici-
pal utility there operates a Diesel engine generating
station which has an installed capacity of 1500 kilo-
2585 watts. It serves approximately 760 customers and the
annual sales amount to about 1,500,000 kilowatt hours.

Cedarburg is located in a rich agricultural area north of Milwaukee, which produces fruits, grains, garden truck and dairy products.

Several mink and fox farms are located near the city, the principal ones being those of Fromm Brothers, who are nationally known in fur circles for their production of silver fox.

A factory producing a nationally known brand of
outboard motors and small gasoline engines is located
2586 at Cedarburg. The loads of all industries within the
city are served by the municipal utility, but the sur-
rounding area is served by Wisconsin Gas & Electric
Company.

The City of Hartford, Wisconsin, operates a steam generating system which produces all the energy required on the distribution system operated by the city. Hartford is located in the open area in the southwest corner of Washington County.

Hartford has a population of 3000 and the municipal electric system operated by the city serves ap-

 2587

proximately 1500 customers, a number of whom are

—1,246—

located outside the city and are not included in the population figure.

The open area south of the symbol indicating the city, represents rural territory served from the system operated by the city. The division of that territory from that of Wisconsin Gas & Electric Company is by agreement between the municipal system and the company. 2588

In 1939, the Hartford municipal utility sold approximately 2,300,000 kilowatt hours to its customers. Hartford is within the general resort area lying in that part of the state and derives a large part of its business from the resort traffic.

The third municipal electric utility generating its own power requirements and operating within the territory of Wisconsin Gas & Electric Company, is that operated by the Village of Lake Mills, Wisconsin.

Lake Mills is located in the western portion of Jefferson County, northwest of the City of Jefferson. 2589

The symbol shown on the map is the one indicating a community served retail from the system of one of the companies. In this case the symbol represents retail service from the gas system of Wisconsin Gas & Electric Company. Wisconsin Gas & Electric Company has no interconnection with the electric system in Lake Mills and sells no energy to that system.

—1,247—

The municipal electric system has a Diesel engine generating system with a capacity of 1100 kilowatts.

2590 *Edward H. Schmidtman—By Respondents—Direct*

In 1939 the system distributed about 1,800,000 kilowatt hours to approximately 1000 customers.

Q. Now, in order to get an idea as to the importance of other communities which Wisconsin Gas & Electric serves, other than those which you have already named, would you indicate the communities served by the company having a population in excess of 3000? A. Do you mean Wisconsin Electric Power Company?

2591 Q. I am sorry—Wisconsin Electric Power Company. A. Yes. Wisconsin Electric Power Company renders electric service in the City of Racine, which has a population of 67,159. Racine is located on the west shore of Lake Michigan, about twenty-five miles south of Milwaukee, and is the second largest industrial city in the State of Wisconsin.

It is served by two steam railroads, one interurban electric railway, and several bus and truck lines.

Racine is widely known for the manufacture of farm implements, milk products, floorwax, and a wide range of specialized machinery. The principal industries are the Ajax
2592 Manufacturing Company; the Belle City Malleable Company; the J. I. Case Manufacturing Company, manufacturers of tractors and other farm equipment; S. C. Johnson & Sons, manufacturers of floorwax and furniture polishes; the Hamilton-Beach Manufacturing Company, which produces vacuum cleaners; the Horlick Malted Milk Company, manu-

—1,248—

facturers of malted milk products; the Nash-Kelvinator Corporation which I mentioned before as being the producer of Nash automobiles—their automobile plant is in Kenosha but they have a plant in Racine—the Twin Disc Clutch Company,

manufacturers of specialized machinery connections; and the Young Radiator Company.

In addition to the industrial activity carried on in Racine, Racine also conducts considerable business resulting from agriculture in the surrounding areas.

It has large residential districts both within the city and outside the city in residential suburbs.

The population of these residential areas are employed
very largely in the industries within and surrounding the
city. 2594

South Milwaukee, Wisconsin, receives electric service from Wisconsin Electric Power Company. It is a residential suburb of Milwaukee, located about ten miles south of Milwaukee. Its population is 11,115.

There are a number of industries located in South Milwaukee, the principal one being the plant of the Bucyrus Erie Company, which manufactures heavy excavating equipment and road-building machinery.

Plants of the Line Material Company, Badger Malleable
& Manufacturing Company, Midwest Tanning Company, The
Rapco Leather Company, and the Wisconsin-Appleton Com- 2595
pany, manufacturers of electrical wiring fittings, are located

—1,249—

in South Milwaukee.

A chemical plant of the DuPont Company is located near the city on the south.

The City of Cudahy, located six miles south of Milwaukee on the shore of Lake Michigan, is served by Wisconsin Electric Power Company.

It is largely a suburb of Milwaukee and is an important unit in the Milwaukee industrial area. Large residential dis-

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tricts are located in Cudahy, the residents of which are employed generally in Cudahy or South Milwaukee, or in Milwaukee, itself, in the industries located in those cities.

Within the City of Cudahy are located the plants of the Ladish Drop Forge Company, manufacturers of heavy drop forgings; The Sherer Leather Company, producers of leather; Cudahy Brothers Company, operators of large packing plants; and George J. Meyer Manufacturing Company, which manufactures bottling machinery of all types.

2597 Q. What is the population of Cudahy? A. The population of Cudahy is 10,550.

The City of West Allis, with a population of 36,146, is located immediately west and somewhat south of the City of Milwaukee, and is adjacent to Milwaukee.

West Allis is a very highly industrialized community. Its principal industries include a wide variety of machinery

—1,250—

manufacturing plants, steel fabrication plants and foundries.

Among these are the Allis-Chalmers Manufacturing Company widely known for its manufacture of power generating
2598 equipment, tractors and other heavy machinery; the Fulton Company; The LeRoi Motors Company; Kearney & Trecker Corporation; and Harnischfeger Corporation, manufacturers of heavy cranes and hoisting equipment, very well known among power plant builders; the Federal Malleable Company; the Pressed Steel Tank Company; the Sterling Wheelbarrow Company; Motor Castings Company; and Davis & Thompson Company.

The latter firm specializes in the design and manufacture of unusually specialized machinery for the performance of particular and precise operations in manufacture.

There are many other industries located in West Allis, but those I have named are among the better known ones and the principal ones.

The City of Wauwatosa is located on the west of Milwaukee and adjacent thereto. It has a population of 26,701 and is almost exclusively a residential suburb of Milwaukee. There are no important industries in Wauwatosa, the residents of the city being employed very largely in business and other lines of endeavor in the Milwaukee industrial area.

West Milwaukee is also a suburb of Milwaukee, located 2600
on the southwest part of the city limits of Milwaukee. Diversified industries are located there, including the Krause

—1,251—

Milling Company; the Linde Air Products Company, which produce various types of compressed gasses; The Robert A. Johnston Company, manufacturers of candies, cookies and crackers; The John Graf Company, producers of Graf beverages, including carbonated drinks and malt liquors; the Chain Belt Company, manufacturers of power machinery; the Cream City Boiler Company, manufacturers of steam
boilers; and the Milwaukee Metal Spinning Company, which 2601
produces spun metal products.

The population of West Milwaukee is 4,423. Many of the residents of West Milwaukee are employed in the industries in the City of Milwaukee and other suburbs other than that of West Milwaukee, itself.

Shorewood, with a population of 15,085, is a residential suburb located on the shore of Lake Michigan, immediately north of Milwaukee. Electric service there is rendered by Wisconsin Electric Power Company.

There are no major industries in Shorewood, the residents of the village being employed in professions and commerce and other activities in the industrial area as a whole.

The Village of Whitefish Bay, Wisconsin, is located immediately north of Shorewood and adjacent to it. It is also a residential suburb of greater Milwaukee, the residents being employed in the professions and other activities in the general area.

Whitefish Bay has a population of 9,479. —1,252—

2603 Wisconsin Electric Power Company renders electric service in the City of Port Washington, which is situated about twenty-five miles north of Milwaukee on the shore of Lake Michigan.

It is identified by a small area which is cross-hatched to indicate service by Wisconsin Electric Power Company, although the area is completely surrounded on the north, west and south, by the territory served by Wisconsin Gas & Electric Company.

Port Washington is the point at which the Port Washington power plant of Wisconsin Electric Power Company

2604 is located.

The city consists very largely of residential areas and is well known in the middle west for its fishing activity. The Smith Brothers operate extensive fisheries on Lake Michigan and Lake Superior, one of which ~~has its head-~~ quarters at Port Washington.

There are a few industries located at Port Washington, among which are the factory of the Wisconsin Chair Company, two foundries and a manufacturer of concrete mixing machinery.

Oconomowoc, Wisconsin, is a city located within the territory of Wisconsin Electric Power Company, which is served at wholesale by the company. It is located on the map toward the western end of the territory of Wisconsin Electric Power Company, near the west line of Waukesha County, and about one-third of the distance south from the

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north county line.

Oconomowoc operates a municipal electric distribution system and purchases its entire power requirements from 2606
Wisconsin Electric Power Company.

The municipal system in the city serves about 1,800 customers and in 1939 it purchased 4,847,539 kilowatt hours from Wisconsin Electric Power Company.

Oconomowoc has a population of 4,524 but few important industries. Among the industries which are located there are dairy plants, a pea cannery where the—strike that. I was going to give you the name of the peas but it slipped my mind—and the milk condensery of the Carnation Milk Company.

Mr. Hamilton: This is a satisfactory breaking 2607
point.

The Examiner: All right. We will recess until 2:00 o'clock.

(Whereupon, at 12:30 o'clock p. m. the hearing recessed until 2:00 o'clock.)

—1,254—

2608 *Edward H. Schmidtman—By Respondents—Direct*

AFTERNOON SESSION

(Whereupon, at 2:00 p.m., September 9, 1940, the hearing reconvened.)

The Examiner: You may proceed.

Whereupon, EDWARD H. SCHMIDTMAN the witness on the stand at the time of recess, resumed the stand, was examined and further testified as follows:

2609 *Direct Examination by Mr. Hamilton (resumed)*:

Q. Mr. Schmidtman, you were describing the cities served by Wisconsin Electric Power Company. Had you finished that description? A. No, I hadn't finished. I would like to take up Milwaukee.

Milwaukee is the largest city served by Wisconsin Electric Power Company.

Its population, according to the 1940 preliminary census figures was 598,558.

The city of Milwaukee covers an area of 44.1 square miles —that is, within the corporate limits.

2610 It is located on the shore of Lake Michigan at the junction and mouth of three rivers—the Milwaukee, the Menominee, and the Kinnickinnic.

—1,255—

Q. I wonder if you would speak just a little louder, please. A. Yes.

The mouth of these three rivers really formed the topographic reason for the original settlement of that spot as the city of Milwaukee, and the rivers are now used to quite an extent as harbors and points of entry for lake shipping that comes into the Milwaukee harbor.

There are extensive piers and ferry slips located on these three rivers and on canals dug between them, and altogether they constitute what is considered the inner harbor of the port of Milwaukee.

There are 144,000 dwellings in the city of Milwaukee, of which 42 per cent. are owned by their occupants. Among the cities of the United States, having a population of 500,000 or more, Milwaukee ranks second in the percentage of families owning radios.

It ranks third in the percentage of families owning homes 2612
and fourth in the percentage of families living in individual dwellings.

The people of Milwaukee are very home conscious, as indicated by the high percentage of property ownership and high percentage of families living in individual dwellings rather than in duplexes and apartment buildings.

Milwaukee is served by three large trunk line railroads

—the Chicago & Northwestern, the Chicago, Milwaukee, St. Paul and Pacific, and the Minneapolis, St. Paul & Sault St. Marie—the latter commonly known as the Soo Line. 2613

The city is also served by six bus lines, seven steamship and barge lines, two car ferries, two transcontinental air-lines, and forty truck lines.

Milwaukee is one of the leading industrial centers of the middle west, ranking ninth among the cities of the United States in the value of annual manufactured products.

Normally almost two thousand industrial plants employ approximately 140,000 people and pay them annual wages amounting to more than two million dollars, and produce goods valued at about one billion dollars a year.

2614

Milwaukee is noted for the worldwide use of its products and for the wide diversification of the industries located there.

In order of importance, the leading manufactured products of Milwaukee are:

First, agricultural implements.

Next, motor vehicle bodies and parts.

Meat Packing products.

Malt liquors, including beer and ale.

2615 Electrical machinery, apparatus and supplies.

Malt, which is a product used in the manufacture of malt liquors.

—1,257—

Steel works and rolling mill products.

Cranes, dredging and excavating machinery.

Bakery products.

Hosiery.

Boots and shoes.

Printing and publishing.

Paints, pigments and varnishes.

2616 Stamped and pressed metal products, including enameling, japanning, and lacquering.

The following well-known industries have plants in the city of Milwaukee:

Briggs & Stratton Corporation, which manufactures automobile accessories and small gasoline motors.

Cutler-Hammer, Incorporated, manufacturers of electrical control equipment.

Delta Manufacturing Company, which produces small wood-working machinery for shops and home use.

The Evinrude Motors Division of the Outboard ~~Marine~~ and Manufacturing Company, which manufactures Evinrude outboard boat motors.

The Falk Corporation, which manufactures heavy machinery and gears, pumps, and heavy equipment of that sort.

The Globe Steel Tubes Company, which manufactures seamless steel tubes for use in boilers, industrial plants in general, and for steel pipe lines.

Globe Union, Incorporated, which manufactures the Globe storage battery, and also recently they have gone into 2618

sidelines, such as roller skates, radio parts, ceramic products.

Harley-Davidson Motor Company, which manufactures the Harley-Davidson motorcycle.

Holeproof Hosiery Company, which knits silk hose.

International Harvester Company, manufacturer of farm equipment.

The Milwaukee plant of International Harvester Company manufacturers trucks.

Linde Air Products Company, producers of compressed gases—acetylene and various other gases used in compressed 2619 form.

Miller Brewing Company, manufacturers of Miller High Life beer and ales.

Nash-Kelvinator Corporation, whose Milwaukee plant manufactures bodies for the Nash automobile.

Pabst Brewing Company, manufacturers of beer and ale.

Phoenix Hosiery Company, another plant which knits full-fashioned hose.

Pittsburgh Plate Glass Company, whose paint and varnish division is located—or one of whose paint and varnish divisions is located in Milwaukee.

Joseph Schlitz Brewing Company, manufacturers of beer and ale.

The A. O. Smith Corporation, manufacturers of welded

—1,259—

steel pipe, automobile frames, and other products, from sheet steel and pressed metal.

Square D Corporation, manufacturers of electrical switching equipment.

Swift and Company, a packing concern.

2621 Q. Is there a municipal plant in Milwaukee? A. The city of Milwaukee operates a small steam power generating station at the municipal garbage incinerator plant.

This steam generating station utilizes heat generated in burning the garbage, and the power generated through that operation is used in operating the equipment at the incinerator plant, such as hoisting the garbage for burning it and handling the ashes, and so forth.

The surplus of the output over those requirements is delivered into the system of Wisconsin Electric Power Company as dump electric power.

2622 The generating station of the city is not a public utility and is no part of a public utility, inasmuch as it serves no customers directly.

All of the energy is used either in the incinerator plant or delivered into the system of Wisconsin Electric Power Company.

The generating station has no other outlet for its power. The power generated at that plant is highly variable with

—1,260—

respect to availability. In the winter time the garbage that is delivered to the plant from all over the city contains more

heat than the garbage that is delivered in the summer, because in the summer time the garbage contains large quantities of melon rinds and grapefruit skins and leaves and peelings from fresh vegetables, which are wet and don't burn well, so during that season of the year it is frequently necessary for the city to apply oil—used cylinder oil from filling stations—to the garbage in order to make it burn.

Under those circumstances, of course, you can be sure that the fuel wouldn't produce enough heat to generate any appreciable quantities of steam. most of the heat being con- 2624
sumed in burning the garbage itself.

Q. There is no other electric utility service in the city of Milwaukee? A. No, there is not.

Mr. Hamilton: May this document be marked as Respondents' Exhibit Number 33 for identification?

The Examiner: It may be so marked.

(The document referred to was marked Exhibit 33 for identification.)

By Mr. Hamilton:

Q. Will you explain, Mr. Schmidtman, what Respondents' 2625

Exhibit No. 33 for identification portrays? A. Exhibit No. 33 is a tabulation showing the number of customers at the end of the calendar years, and the total annual sales of electricity during the calendar years from 1910 to 1939, for Wisconsin Electric Power Company; from 1912 to 1939 for Wisconsin Gas & Electric Company, and from 1923 to 1939 for Wisconsin Michigan Power Company.

Q. Has this table been prepared under your supervision? A. Yes, it has.

Q. Have the facts shown been taken from the records of the respective companies indicated? A. They have.

Mr. Hamilton: I offer it in evidence as Respondents' Exhibit No. 33.

Mr. Binford: I would like to ask one or two questions, please.

By Mr. Binford:

Q. The number of customers refers solely to customers
2627 furnished with electric energy? A. Yes, with electric energy only.

Q. The table has no reference in any way to gas service to customers? A. None whatever.

Q. And in each case the figures given are as of the end

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of the calendar year indicated? A. The number of customers shown are as of the end of the calendar year, and the kilowatt hours sold are during the calendar year.

Q. During? A. Yes.

Mr. Binford: No objection.

2628 The Examiner: The tabulation is admitted in evidence as Respondents' Exhibit No. 33.

(The document referred to was received in evidence as Respondents' Exhibit No. 33.)

By Mr. Hamilton:

Q. Referring to Exhibit No. 33, Mr. Schmidtman, do the statistics shown include sales by the respective companies to other electric utilities? A. Yes, they do, and that fact is indicated by Note One at the bottom of the exhibit.

Q. More specifically, the table, then, includes sales by Wisconsin Electric Power Company to the other two companies named in the table? A. Yes, the sales shown for Wisconsin Electric Power Company include sales to all electric utilities including Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company.

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Likewise, the figures for Wisconsin Gas & Electric Company include all sales to other electric utilities, including—Wisconsin Gas & Electric Company doesn't sell any energy to 2630
either of the other two companies.

The figures for Wisconsin Michigan Power Company include all sales to other electric utilities, including the sales of that company to Wisconsin Electric Power Company.

Q. Now, the figure shown for the year 1939 as kilowatt hours sold by Wisconsin Gas & Electric Company appears to be a figure somewhat in excess of 170 million kilowatt hours.

Do you have the figures for the sales for that year by Wisconsin Electric Power Company to Wisconsin Gas & Electric Company? A. Yes. During the year 1939 Wisconsin Electric Power Company sold to Wisconsin Gas & Electric Com- 2631
pany 206,189,655 kilowatt hours.

That figure does not appear individually in the tabulation.

Q. But is to be included in the amount sold by Wisconsin Electric Power Company? A. That is correct.

Q. Can you explain the excess of the figure which you have last given over the figure of 170 million plus shown on the table? A. Yes. A portion of the kilowatt hours which

—1,264—

Wisconsin Electric Power Company sells to Wisconsin Gas & Electric Company in every year is used by the latter company in conducting its own operations.

The major portion of that use by Wisconsin Gas & Electric Company is consumed in operating its gas plant at Racine, and that energy is not resold by Wisconsin Gas & Electric Company.

Another portion of the kilowatt hours purchased by Wisconsin Gas & Electric Company is consumed in the form of
2633 losses incurred in distributing the energy which is sold to its customers.

Those two items—that is, the company's own use and the losses in transmission and distribution—account for the difference between the energy sold to Wisconsin Gas & Electric Company and the amount of energy sold by it to its customers.

In addition to the energy which Wisconsin Gas & Electric Company purchases from Wisconsin Electric Power Company, Wisconsin Gas & Electric Company also generates a small amount of energy.

2634 In the year 1939 its generation was less than one per cent of its total energy requirements.

Q. I note from the table that, while the statistics on Wisconsin Electric Power Company are first given for the

—1,265—

year 1910, statistics for the other two companies indicated began at later periods. Will you explain why the later period is used? A. In each case we began the data for the respective companies in the earliest year at which continuous records down to the present time began.

 2635

Such records began in 1910 for Wisconsin Electric Power Company, in 1912 for Wisconsin Gas & Electric Company, and in 1923 for Wisconsin Michigan Power Company.

Q. Will you amplify further the information set forth in Note 2 of the table? A. Yes. Note 2 explains that prior to the year 1938 the kilowatt hours consumed by the transportation operations of the Milwaukee Electric Railway & Light Company, which was the name of Wisconsin Electric Power Company prior to October 1938——

The Witness: Will you read that please? 2636

(Whereupon the last answer was read back by the Reporter.)

A. (Continuing.) —were treated as energy transferred from the Electric Department to the Transportation Department of the Milwaukee Electric Railway & Light Company.

Being treated as a transfer of energy from one department to another, these kilowatt hours were not included in the kilowatt hours sold as shown by this tabulation before 1938. However, the energy consumed, at the beginning of 1938, by the Transportation Department was treated, for 2637

—1,266—

accounting purposes, as a sale, and, from that time, such energy has been included with the sales shown on this table.

Q. For the full years 1938 and 1939? A. For the full years 1938 and 1939.

Q. The table indicates a substantial growth in the number of customers and kilowatt hours sold. Has that growth been due entirely to the development of the facilities of the respective companies or has it been due to some other cause

2638

—in part, at least? A. The growth shown here is due in part to acquisitions of small electric utility systems operating in the vicinity of the territories served by each of these three companies. In the case of Wisconsin Electric Power Company, several small systems were acquired during the period covered by these statistics.

Those acquisitions represent a small part of the extent of service rendered by the Company, and the last one was made in 1930, when Wisconsin Electric Power Company
2639 acquired the municipal electric distribution system in the city of Port Washington.

Since the year 1930, Wisconsin Electric Power Company has made no such acquisitions and all of the change in load since that time has come about through development of the territory served by the Company and through more extensive development of the service needs within its area.

—1,267—

In the case of Wisconsin Gas & Electric Company, it is likewise true that a number of acquisitions were made during the period covered by the tabulation.

2640 The last of such acquisitions was made in 1932, when Wisconsin Gas & Electric Company purchased the properties of the Wisconsin Public Utilities Company operating in and around the city of West Bend and the Village of Barton.

Since 1932 Wisconsin Gas & Electric Company has acquired no electric properties, and the growth in its number of customers and volume of sales has come about as a result of the Company's efforts in increasing the use of its service within the territory served.

Wisconsin Michigan Power Company has acquired small electric systems during the period shown. The last one

 2641

acquired was a small distribution system in the community of Trout Creek in Michigan. That community is not shown on Exhibit 32.

The Trout Creek system was acquired in 1929 and since that year no further acquisitions have been made by Wisconsin Michigan Power Company.

The growth in number of customers and kilowatt hours sold since that time has also been a result of the Company's development of service within its area. 2642

Q. I believe you indicated that, with respect to Wisconsin

Electric Power Company there were no continuous records of the number of customers and kilowatt hours sold prior to the year 1910.

Does the Company have any record for any year prior to that time? A. Yes. One of the officers of the Company, who has been with the Company and its predecessors a number of years, has a memorandum record in one of the old volumes of the Company's accounts, which indicates that in 1900 the Milwaukee system served 1,451 customers, who con- 2643
sumed about five million kilowatt hours in that year.

From the period 1900 to 1910, as I have explained, we have no continuous records and the record for 1900 is a memorandum record in one of the older books of the Company.

From that beginning the service of Wisconsin Electric Power Company has increased to more than 250,000 customers and the sales have increased to nearly 1,200,000,000 kilowatt hours.

Mr. Hamilton: May this document be marked as Respondents' Exhibit No. 34 for identification?

The Examiner: Yes.

(The document referred to was marked Respondents' Exhibit No. 34 for identification.)

By Mr. Hamilton:

Q. I will ask you later, Mr. Schmidtman, to explain the

—1,269—

2645 caption headings shown on Exhibit No. 34. Would you, at this time, explain what Exhibit No. 34 purports to portray? A. Exhibit No. 34 is a tabulation showing the number of customers at the end of the year 1939, and the kilowatt hours sold during the year 1939 for each of the three companies in the Wisconsin Michigan group, namely Wisconsin Electric Power Company, Wisconsin Gas & Electric Company, and Wisconsin Michigan Power Company, segregated according to the service classification indicated in the column headings.

Q. This table has been prepared under your supervision?

2646 A. Yes, it was.

Q. Were the facts shown similarly taken from the records of the respective companies indicated? A. Yes.

Mr. Hamilton: I offer it in evidence as Respondents' Exhibit No. 34.

Mr. Birford: I would like to ask a question or two in regard to this exhibit.

By Mr. Binford:

Q. Will you please explain the distinction between small commercial and industrial and large commercial and industrial? A. Yes.

Q. They are shown in separate columns on this table?

—1,270—

A. Yes.

I will explain the large commercial and industrial first. The large commercial and industrial group of customers include commercial customers who take service at secondary voltage—that is, below 3800 volts—and who contract to pay for a minimum monthly demand of fifty kilowatts.

The industrial customers included in this group are those customers which are served at primary voltages of 3800 2648
volts, 13,200 volts, or 26,400 volts, who furnish their own sub-stations and who contract for a minimum monthly demand of 100 kilowatts.

The small commercial and industrial customers are the commercial customers and industrial customers who do not qualify under the requirements of the large group.

—1,271—

Q. And there is a further column headed "Other Electric Utilities." Will you please explain what that caption means? A. Yes. That group includes all electric utility 2649
systems to which the respective companies shown in the first column sell electrical energy at wholesale rates for resale by those electric utilities.

Included in that caption would be the utilities I discussed this morning as operating in the various municipalities. It also includes, in the case of Wisconsin Electric Power Company—it includes Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company inasmuch as Wisconsin Electric Power Company sells energy to both of those.

2650 *Edward H. Schmidtman—By Respondents—Direct*

In the case of Wisconsin Michigan Power Company, it includes Wisconsin Electric Power Company, because the former sells electricity to the latter.

Mr. Binford: No objection.

The Examiner: Respondents' Exhibit No. 34 for identification is now admitted in evidence.

(The document referred to was received in evidence as Respondents' Exhibit No. 34.)

2651 *By Mr. Hamilton:*

Q. Will you explain further, Mr. Schmidtman, the caption headings shown in the respective columns in addition to

—1,272—

your statement as to three of the columns? A. The data included in the column with the caption heading "Residential" include customers and sales under the regular residential rate of the company for general residential use as well as the customers and sales under the company's residential water heating rates.

2652 In every instance in which we sell residential water heating service, we also sell residential general service. There has been no duplication in the number of customers due to that overlapping of service.

Such customers have been numbered only once although their total kilowatt hour sales have been included under the sales.

The caption "Rural" includes customers taking service under our regular rural service rate, as well as those taking service under the rural water heating rate and the sales

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under that caption include the sales under both of those rate schedules.

The small commercial and industrial, I believe I have explained satisfactorily, and also the large commercial and industrial customers. However, I might add that under the small commercial and industrial group we include flat rate commercial lighting, metered commercial lighting, combined light and power, breakdown and demand power, commercial power, optional power, battery charging, cooking and refrigeration, and optional cooking and heating. 2654

—1,273—

The next group which is headed "Other Sales to Public Authorities" includes our sales under the municipal primary rate to Milwaukee City, the municipal primary rate for park lighting, the municipal secondary rate for playgrounds, the municipal secondary rate for Milwaukee City, the municipal primary rate for other cities, and the municipal secondary rate for other cities.

Under "Other Electrical Utilities" we have included all sales to electric public utilities for resale. One group under that caption is the affiiated companies and another is the 2655
non-affiliated systems.

In the last column preceding the total, headed "Railways for Motive Power" we have included our sales to all electric railway systems to which the companies sell electrical power.

Q. Will you state what those railways are? A. I beg your pardon.

Q. Will you state what those railways are? A. Yes. In the case of Wisconsin Electric Power Company, the three customers are the Milwaukee Electric Railway and Transport Company which is the subsidiary of Wisconsin Electric

2656

Power Company, Wisconsin Gas & Electric Company, which operates a small transportation system in the City of Kenosha and the Chicago, Milwaukee and North Shore Railway which operates an electric interurban railway line between Chicago and Milwaukee.

—1.275—

In the case of Wisconsin Gas & Electric Company, the one customer is the Milwaukee Electric Railway and Transport Company.

2657 Q. You have indicated two of the customers falling under the caption "Other Electric Utilities," Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company, Wisconsin Electric Power Company. What are the other two covered by that caption? A. Sales to other electric utilities you mean?

Q. Right. A. The other two are the City of Oconomowoc, to which the company sells energy wholesale for resale and Wisconsin Power & Light Company with which Wisconsin Gas & Electric Company has an interconnection for the interchange of emergency service.

2658 Q. Other than sales to municipal electric comparies, is there, in the case of Wisconsin Gas & Electric Company, any other electric utility comprehended by the caption there? In other words, are the seven customers listed solely municipal electric utilities? A. I will check that. Yes, they are.

Q. And I believe you have indicated that the figures shown for Wisconsin Michigan Power Company include sales by it to Wisconsin Electric Power Company? A. Yes, I have. That is the case.

—1,276—

Q. There appear on the table two items captioned "Adjustment," and each bearing an asterisk, and there also appears an asterisk footnote. Will you explain further the significance and necessity for the asterisk footnote? A. As I have pointed out, this tabulation includes sales to other electric utilities. Included in the sales by Wisconsin Electric Power Company to other electric utilities are its sales to Wisconsin Gas & Electric Company.

That electric energy is then resold by Wisconsin Gas & Electric Company to its customers. 2660

Now, in order to prevent a duplication of energy—that is, in order to keep those same kilowatt hours from appearing twice in the tabulation, it is necessary to subtract them from the total sales for the group.

The same thing is true with respect to energy sold by Wisconsin Electric Power Company to Wisconsin Michigan Power Company and by Wisconsin Michigan Power Company to Wisconsin Electric Power Company.

Those three sales constitute the three customers shown in the adjustment under "Other Electric Utility Customers" and the 259,968,493 kilowatt hours adjustment under that 2661
caption represent the kilowatt hours involved in this interchange.

Q. Is there a substantial degree of diversity in the service requirements of the customers of the respective companies?

—1,277—

A. Yes, there is. The service requirements of the customers served by the three companies vary all the way between two widely separated extremes. The average small customer or rather the typical smallest customer of any of the companies would be a residential consumer using little or no energy in a month.

We have, as all electric utility systems have, a number of so-called minimum bill customers. Our bill for such customers is 60 cents a monthly net. That is a service charge which is made against the customer whether he consumes any kilowatt hours or not and it is intended to cover the fixed components of the cost of rendering electric service.

From a customer of that kind the service requirements range up to the requirements of huge industries that consume several million kilowatt hours a month, and the bills
2663 will range from the minimum of 60 cents to well up into tens of thousands of dollars.

To give an indication of the distribution of our customers over this wide range of service requirements, I can say that 80 per cent of the customers of Wisconsin Electric Power Company are residential customers. Slightly over 6 per cent are rural customers, 12 per cent are small commercial and industrial—I am speaking now with respect to number of customers—and the remaining one odd per cent of our cus-

—1,278—

tomers are made up of large commercial and industrial, street
2664 and highway lighting, other public authorities, other electric utilities, and electric railways.

Now, with respect to the kilowatt hours sold to these various classes of customers, the residential consumers take about 22 per cent of our total sales.

The rural customers take about 2½ per cent. The small commercial and industrial customers consume about 14 per cent. The large commercial and industrial consume more than 45 per cent. Street and highway lighting customers take nearly 3 per cent. Other public authorities nearly 2 per

cent; other electric utilities a little over 3 per cent; and electric railways about 7½ per cent.

Q. Are these percentages which you have given applicable in the case of Wisconsin Electric Power Company or are they on the basis of three company figures? A. They are applicable to Wisconsin Electric Power Company only.

Q. You were speaking of the diversification of use among various customers. Can you amplify that further? A. Yes, I can. The service requirements of electrical customers vary from those of consumers in small apartments or one-room 2666
cottages, many of whom are our minimum bill customers, to those of people who live in all-electric homes, a large number of which we serve.

—1,279—

An all-electric home will include the usual lighting and electrical appliances as well as electric range, an electric water heater, an electric air-conditioning system. Such customers will consume from 6000 to twelve or fifteen thousand kilowatt hours a year each—one residential customer. The use of electricity in our rural areas also varies over quite a wide range. 2667

Some of our farm customers use electric service for residential use only. Some of them expand that use to include yard and barn lighting, and others use it for a still wider variety of purposes.

Among these are the operation of milking machines, pumping water, cutting and elevating silage, heating seed beds, and irradiating cattle and chickens, and numerous other purposes.

Some of the other purposes would be operating an electric fence. An electric fence consumes very little electrical

energy but it is one of the ways in which the modern farmers in our territories are making use of our service. An electric fence is a rather ingenious device by which a cow or any other animal that comes too close to the fence will receive a pulsating shock. It isn't harmful but it is very effective.

Electricity is used by farmers in heating seed beds—more generally, however, by operators of greenhouses and individuals who raise plants for sale for planting in gardens

2669 —1,280—

and vegetable beds.

These seed beds are heated by cables buried in the soil which maintain a higher temperature in the soil and produce quicker and much stronger germination of the seeds, resulting in an earlier start and more hardy plants.

Electricity is used in sun lamps for subjecting cattle and flocks of chickens to ultra-violet rays. It has been found that the use of sun lamp irradiation on cattle has resulted in a marked reduction in bacterial content of the milk, a greater resistance on the part of cattle to common diseases and a
2670 much lower mortality in calves. It has been used on test flocks of chickens and a wide range of tests indicates that the productivity of the chickens in number and weight of eggs laid can be increased by as much as 20 per cent in a flock that is irradiated in comparison with one that isn't.

An outstanding example of extensive use of electricity on the farm in the territories served by the Wisconsin-Michigan group is found in the case of the Brook Hill Dairy Farm which is served by Wisconsin Electric Power Company. That farm consumes well over a hundred thousand kilowatt hours a year.

It comprises a total of nine milk-producing farms, all operating under one joint management. The herd that they

—1,281—

have on those farms numbers a little over eight hundred cows. The cows aren't all yielding at the same time but they are all active members of the herd and when a cow goes dry she is transferred to what they call the dry farm and is kept there until she again begins giving milk and then she is brought back to one of the producing farms.

Three of these farms produce certified milk. No—two 2672
of them produce certified milk. And the Brook Hill Farm is one of the three dairy farms in the entire state of Wisconsin which are allowed to produce certified milk. Certified milk is not pasteurized; it is marketed raw, and in order for farms to have the permission of health authorities to market such milk, they must answer to very rigid requirements of sanitation.

The other two farms in Wisconsin which produce certified milk are located in the immediate vicinity of the Brook Hill Farm and are both served by Wisconsin Electric Power Company. 2673

Now, the connection of certified milk to electric service may seem farfetched except when we consider that dairy farm sanitation is directly related to the availability of water and refrigeration, and both the water and the refrigeration are furnished electrically on these farms.

Mr. Hamilton: Off the record.

(Discussion off the record.)

—1,282—

Mr. Hamilton: Back on the record.

2674 *Edward H. Schmidtman—By Respondents—Direct*

By Mr. Hamilton:

Q. You have indicated that Wisconsin Michigan serves a substantial rural territory. Is that also true of Wisconsin Electric Power Company and Wisconsin Gas & Electric Company? A. Yes, that is true. Particularly of Wisconsin Gas & Electric Company. Wisconsin Electric Power Company does serve a very highly developed agricultural area in Waukesha County—one of the richest agricultural counties in the State of Wisconsin.

2675 Wisconsin Gas & Electric Company, serving the rim of territory lying all the way around that of Wisconsin Electric Power Company, naturally reaches into more of a rural area than Wisconsin Electric Power does in serving the industrial section along the lake.

I have mentioned the milk condenseries and processing plants and the production of butter and cheese in the communities served by Wisconsin Gas & Electric Company. Those industries bear out the presence of very active dairying territory in the entire district served by the company. Wisconsin is one of the foremost dairying states of the Union

2676 and our territories are among the best of the dairying districts in the State.

Q. What is the largest customer of Wisconsin Electric

—1,283—

Power Company? A. The customer that takes the largest amount of energy from Wisconsin Electric Power Company is Wisconsin Gas & Electric Company. Due to the diversification of loads served by Wisconsin Gas & Electric Company the character of its demands upon the system of Wisconsin Electric Power Company with respect to hour of

 2677

the day and seasons of the year, is very much like the demands of Wisconsin Electric Power Company's own direct loads, and because of that diversity or diversification, the loads fit in very well, being of much the same character.

In 1939, Wisconsin Michigan Power Company purchased —I am sorry—Wisconsin Gas & Electric Company purchased 206,189,655 kilowatt hours from Wisconsin Electric Power Company and imposed a maximum demand of 49,133 kilowatts. Of those total sales, 198,546,493 kilowatt hours were
for resale by Wisconsin Gas & Electric Company to its own 2678
customers, the remainder—that is, the difference—being used by Wisconsin Gas & Electric Company in carrying out its own operations.

Q. What is the largest ultimate consumer of Wisconsin Electric Power Company? A. The A. O. Smith Corporation is the largest ultimate consumer of Wisconsin Electric Power Company.

Q. You are speaking outside of the system, are you not?

—1,284—

Isn't the Transport Company a large consumer? A. Yes, I
am sorry. I was thinking of private customer. The Mil- 2679
waukee Electric Railway and Transport Company is the largest ultimate consumer on the system of Wisconsin Electric Power Company. That is the transportation subsidiary of Wisconsin Electric Power Company.

Q. Are all of its requirements purchased from the Wisconsin Electric Power Company? A. Yes, they are.

Q. Of its electrical requirements? A. All of their electrical requirements. Prior to October of 1938, as I have previously testified, the transportation operations were carried on as a part of Wisconsin Electric Power Company whose

name was then the Milwaukee Electric Railway & Light Company.

The power which is purchased by Milwaukee Electric Railway and Transport Company is all 600-volt direct current energy which is used for motive power in operating the street cars, trolley busses and interurban railway cars, and some alternating current service used in its shops and in lighting its office and storeroom buildings.

Delivery of 600-volt direct current energy is made at
2681 thirty different railway sub-stations which are owned and operated by Wisconsin Electric Power Company. These substations are located all over the area which is served by the

—1,285—

Milwaukee Electric Railway and Transport Company.

Q. Could you indicate generally what that area served with transportation service is? A. Yes. The Milwaukee Electric Railway and Transport Company operates a street railway system with auxiliary gasoline busses in the City of Milwaukee and its immediate suburbs.

In the same area it also operates trackless trolley lines in
2682 serving the metropolitan area. It also operates an interurban electric railway system reaching north to Port Washington, west to Watertown and south to Kenosha.

A shorter branch of the interurban line runs as far south as Hales Corners on the western part of the Milwaukee County.

Q. The points of delivery to the Transport Company are not confined to Milwaukee proper then, are they? A. No, they are not. They are not. As I have just stated, the interurban system reaches out into neighboring cities.

—1,286—

 2683

By Mr. Hamilton:

Q. They deliver at the neighboring cities as well? A. Yes, delivery of energy to the Transport Company is made at a number of points, many of which are located considerable distances from Milwaukee.

Delivery is made in those instances through railway substations. Some energy is delivered directly to the Transport Company within the City of Milwaukee and is generated there, but that represents a minor portion of the total consumption. Most of the energy delivered to the Transport 2684
Company is energy that has been converted from alternating current to direct current for use in the trolley system.

Q. What is the approximate consumption of current by the Transport Company which it purchases from Wisconsin Electric Power? A. That varies somewhat from year to year but normally ranges between ninety million and one hundred million kwh per year, at demands running up to 42,000 kilowatts.

Q. Can you indicate the extent of the demand placed on Wisconsin Electric Power Company system by industrial 2685
users in the territory served? A. The industrial customers of Wisconsin Electric Power Company who, as I have explained, take their service at primary voltage, constitute only two-tenths of 1 per cent. of the number of customers served, but their consumption amounts to 45½ per cent. of the total

by the company.

Q. Your figure of 45 per cent., is that expressed in terms of kilowatt hours? A. Yes, 45½ per cent. of the kilowatt hours sold by the company, are sold to the industrial customers.

This class includes 230 consumers and in 1939 those consumers purchased nearly 360,000,000 kilowatt hours. They represent a very wide diversification of industry, also. Altogether there are more than forty different classes of industry represented in that group, many customers falling in each of the several classes.

The largest of these groups are automotive specialties, fifteen customers; bakeries, seven; dairies and dairy products, eight; electrical equipment manufacturing, eleven; iron
2687 and other metal foundries, twenty; electric steel foundries, eight; grain elevators and malting manufacturers, eight; ice manufacturing, ten; heavy machinery manufacturing, ten; light machinery manufacturing, eight; steel fabrication, fourteen; and tanning, eleven.

The other one hundred-odd customers represent more than thirty different types and there are smaller numbers in each of the various groups.

Now, the character of our industrial service is generally indicated by this array of industry. According to data published by the Milwaukee Association of Commerce, the Mil-
2688 waukee industrial area, including Milwaukee, Racine and

—1,288—

Kenosha, consumes more steel—consumes, not produces—more steel than any other similar area in the United States.

It leads in the country in the production of heavy pumping machinery, hydro-electric generating equipment, large excavators.

Milwaukee, itself, leads the country in production of silk hose. The tanneries that are located in the City of Milwaukee constitute one of the major industries. One of the tanneries there, Gallun & Sons Company, produces a type of leather

that is produced nowhere else other than in Norway. It is called a Norwegian calf and is a vegetable tanned leather, a choice leather.

I don't know why it is that the tanneries have located so largely in the Milwaukee area, but they are there and they represent one of the major classes of the industry served by the company.

Possibly, it is related to the dairying industry and the meat-packing industry, resulting in the production of hides for tanning. 2690

Q. Does the Wisconsin Electric Power maintain detailed data on industrial users? A. Yes, they do. We make a practice—speaking of the Wisconsin Electric Power Company—of maintaining a running record of the demand and energy consumption of the thirty largest industrial customers

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served by the Wisconsin Electric Power Company.

These thirty customers represent a wide range of type of industry and we have learned that statistics on their requirements furnish a very good barometer of industrial activity in the Milwaukee area. 2691

We have kept this record for a number of years and use it to a considerable extent in framing load estimates, making budgets and other estimates which are influenced by anticipated industrial activity in the territory.

Now, we also keep similar records on the consumption and demand of the A. O. Smith Corporation, which is the largest single private customer served by Wisconsin Electric Power Company. This customer is so much larger with respect to power requirements than any of the other thirty that we find it necessary to hold it out separately from the

group because of the heavy effect it has on the averages, but we nevertheless maintain those records and watch them carefully in connection with our anticipated industrial activity.

These thirty-one customers are all primary customers; that is, they take service at the primary voltages of 3810, or 13,200, or 26,400 volts. They own and operate their own step-down sub-stations.

The thirty-one customers have sub-stations with a total capacity of over 130,000 kva. Their demands on the system,

2693 —1,290—

of course, are not coincident. That is, they don't all reach their maximum values at the same time, but the total non-coincident maximum demands of these thirty-one customers was 65,000 kilowatts in 1939 and the combined consumption of these thirty-one customers was over 201,000,000 kilowatt hours.

You will observe that this quantity of energy is well over one-half of the 360,000,000 taken by the 230 industrial customers, and it is more than one-fifth of the total sales of

2694 Wisconsin Electric Power Company to all of its customers, so we feel that in taking these thirty-one customers as a barometer, we are using a very substantial and most representative sample of our industrial service.

Q. When you say that that sale represents more than one-fifth of total sales, don't you mean total sales to ultimate consumers, rather than total kilowatt hours sold? A. Yes.

Q. You are distinguishing in that instance—— A. (Interposing) Yes; one-fifth total sales to ultimate consumers. That is right. I didn't say that, but I should have.

Q. You spoke of the A. O. Smith Corporation. Does that demand upon the system create peculiar service problems? A. The A. O. Smith Corporation does make some very heavy

—1,291—

demands upon the system of the Wisconsin Electric Power Company and in meeting the requirements of that customer, the company has been required to install special facilities for carrying service to the customer's sub-station.

The A. O. Smith Corporation uses electricity for operat-
ing presses and cold process machines of all descriptions. 2696
The plant obtained some fame a few years ago because of its automatic automobile frame plant.

It had an assembly line arrangement which would turn out automobile frames with a minimum of manual labor. The presses would take the sheets which had been previously cut in the proper shape and would press them cold into the channels and the braces that were required in making the frames. Those would be passed on by mechanical conveyors and picked up automatically by the machine as the elements of the frame went through and the frame would gradually
take shape. 2697

Automatic machines would place the rivets and rivet them over and the frame would come off at the end completely assembled. Very little manual work was required.

Up to fourteen years ago, the A. O. Smith Corporation generated a portion of its own power requirements and purchased the remainder from the company. Since that time, however, the customer has purchased all of its energy from Wisconsin Electric Power Company.

The principal product of that customer is, at the present

—1,292—

time, welded steel pipe of various diameters.

This pipe is used in building pipe lines, oil pipe lines, gas transmission lines and is also used quite extensively for oil well casings.

Their plant also produces stills of various sizes for use in distilleries and chemical plants, and other plants that have use for equipment of that kind. They also make welded steel tanks, one of the special types of which is a glass-lined tank which they make for chemical plants.

2699 Wisconsin Electric Power Company delivers service to the A. O. Smith Corporation at 26,400 volts over three circuits which were built particularly for that service. These circuits receive their power from the Granville Sub-Station which is one of the major sub-stations in the company's system and serves the industrial loads in the northern and western portion of the Milwaukee metropolitan area.

Q. Are there other large customers whose demands place unusual requirements on the company's service? A. Yes, there are. One of them that is outstanding for that reason is the Bucyrus-Erie Company. This customer manufactures
2700 excavators, steam shovels, drag lines, cranes, dredges, tower excavators, of all types.

An interesting comparison can be made to indicate the range of sizes of excavators made in that plant by pointing out that at one time they had under construction there, two

—1,293—

excavators, one with a capacity of ⅜ of a cubic yard, and one with a capacity of thirty cubic yards.

Electricity is used by the Bucyrus-Erie Company in a number of ways. It is used to operate electric, steel and brass

furnaces for heat-treating, for lighting purposes, of course, and for general power use.

Among the power uses are the handling of the raw materials and their products in various stages of completion, the cleaning of castings, which is done by air and water under pressure, various machining operations, arc welding, and the operation of the machine shop and other general purposes.

The steel melting furnace is the phase of their business that causes unusual service requirements to fall on the system of the Wisconsin Electric Power Company. The loads 2702
imposed by that furnace are very highly intermittent during the melting period.

The furnace has a six-ton capacity and it operates by means of electrodes, controlled by reversing motors. The electrodes are three carbon poles which are forced down into the furnace after the furnace has been filled with the steel that is going to be melted, usually scrap. The moment those electrodes make contact with the steel, the steel short circuits them and a tremendous current flows.

The reversing motors, one of which is on each of the electrodes, will immediately withdraw the electrode in order to 2703

hold the current within the set range, but for the instant the current is tremendous.

It is almost a dead short circuit across the system and the ammeter that measures those currents kicks so violently over against the peg that it is sometimes a marvel that the hand doesn't break off.

It is only instantaneous, however, and then comes back as soon as the reversing motor operates.

Now, we do not bill the customer for those extremely high momentary demands, because the customer's demands on the system are measured through a watt meter which indicates the average demand during each successive fifteen-minute period. Although we don't bill the customer for those instantaneous demands, we still must maintain facilities capable of carrying them and so we have circuits of high capacity and the customer has a sub-station of high capacity, sufficient to carry those instantaneous, high demands with-
2705 out throwing something out of operation.

This customer purchases energy from the company at 13,200 volts which it steps down through its own sub-station and it generates a portion of its energy requirements.

Q. Can you mention a few of the other large users whose services also impose unusual requirements? A. Yes, one of the best known of our customers that has unusual service requirements is the Joseph Schlitz Brewing Company. This

—1,295—

customer manufactures "The Beer that Made Milwaukee Famous", according to their advertisements.

2706 The Schlitz Company operates one of the oldest and largest breweries in the United States. They carry out in that plant all of the stages in the manufacture of beer and ale, including the processing of the malt.

That isn't true of all breweries. Many of the breweries served by the Wisconsin Electric Power Company and the other companies of the group, in fact, buy their malt already processed from malt manufacturing plants, a number of which are served by Wisconsin Electric Power Company.

The Schlitz Company has maintained the same mother yeast plant in its brewery that it had before prohibition

came into effect. They maintained the proper temperature and provided the proper feeding according to the plant chemist, to keep that plant alive and active, and they are still using the yeast from that same plant that they were using before prohibition came into effect.

The power requirements of the Schlitz Company are remarkably steady and continuous. A large amount of the energy which they purchase from Wisconsin Electric Power Company is used in operating refrigerating equipment on which they have a very heavy load. 2708

Electricity is also used in various pumping operations and in the operation of their large kettles and to some ex-

—1,296—

tent in the bottling and barrelling works.

The continuity of service is very important to the Schlitz people because they must maintain careful control of temperatures and timing of operatings in order not to produce a product of variable characteristics.

Flavor is an extremely important thing and timing and temperature are quite important in producing the constant flavor of their product. 2709

Before prohibition, the Schlitz Company generated all of the energy consumed in its operations. After the repeal of the prohibition law, the Schlitz Company began producing regular beer again and found their generating equipment inadequate, so they shut it down and are now purchasing all their electric power requirements from Wisconsin Electric Power Company.

They do still operate a boiler plant which furnishes some steam for processing and furnishes steam for operating

direct driven air compressors which they use in some of their refrigeration operations.

The Examiner: We will have a short recess.

(Whereupon a short recess was taken.)

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(Whereupon, after a brief recess the hearing resumed.)

2711 *By Mr. Hamilton*:

Q. What is the largest electric customer of Wisconsin Gas & Electric Company? A. The American Brass Company, located at Kenosha, is the largest customer served by Wisconsin Gas & Electric. This plant is a unit of the Anaconda Wire & Cable Company. It produces copper wire, copper tubing, and also manufactures a wide variety of copper and brass fittings. They utilize electricity in furnaces and many other heating operations as well as for a wide range of general power use and lighting.

2712 Q. Is copper mined in Wisconsin? A. No, it is not. Copper is mined in upper Michigan, outside the territory of Wisconsin Michigan Power Company. The metals are brought in and are worked into the finished product in the mill at Kenosha.

Q. And what is the largest electric customer of the Wisconsin Michigan Power Company. A. The largest customer served by the Wisconsin Michigan Power Company is the ~~Kimberly Clarke~~ Corporation which I mentioned this morning. That company operates four mills in the Fox River Valley in the vicinity of Appleton and one mill on the Menominee River at Niagara, Wisconsin. The four mills on the

Fox River use water power from the Fox River as well as steam generated in their own plants and in the case of two of

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the plants they generate all of the power required in their operations. In the other two plants the power requirements are met partly by generation from water power and partly by purchases from Wisconsin Michigan Power Company. In the case of the latter two plants the sales of Wisconsin Michigan Power Company to the customer are very heavy.

Kimberly Clarke Corporation is installing and buying 2714
machinery at the present time for a new product, the identity of which they have not disclosed, but it will be some new and, it is anticipated, unique application of the use of wood fibres to some sore of paper product.

In connection with that expansion they are providing a new substation with a capacity of 4,000 k. v. a. through which they expect to take power from the Wisconsin Power Company for the new operations.

The hydroelectric plant that is located at Niagara uses water power from the Menominee River as I have previously explained. In 1938 the Wisconsin Michigan Power Com- 2715
pany entered into a contract with Kimberly Clarke Corporation covering the interchange of power between the customer and the company at Niagara. In carrying on its paper mill operations at that point Kimberly Clarke need a constant supply of electric power, more constant than that furnished by the Menominee River through its hydroelectric units, so it was faced with the necessity of purchasing additional energy or of installing additional generating capacity of its

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own.

Consideration was given to the installation of a steam plant. Inasmuch as paper mills use steam in their paper processing, many of them have found it economical to first use the steam to generate electricity and then take it from the generating unit and use it for heating purposes. Instead of doing that, however, Kimberly Clarke entered into an agreement with the Wisconsin Power Company by which energy is now interchanged between the customer and the company.

2717 During the seasons when the load is inadequate Wisconsin Michigan Power Company furnishes energy. During the seasons when there is surplus power available it is delivered into the system of the Wisconsin Michigan Power Company.

An interesting provision of that contract, aside from the furnishing of firm power by Wisconsin Michigan Power Company and the furnishing of surplus hydroelectric power, is a provision which specifies that at such times of the year as Kimberly Clarke Corporation can do so it will deliver hydroelectric energy into the system of Wisconsin Michigan
2718 Power Company between the hours of 7:00 a. m., and 7:00 p. m., and Wisconsin Michigan Power Company will return similar or equal amounts of energy during the succeeding period of 7:00 p. m. to 7:00 a. m.

The reason for that arrangement is that it furnishes Wisconsin Michigan Power Company a source of additional energy during the daytime hours when the loads on its system are higher than they are during the night, and also

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enables Wisconsin Michigan Power to make up and repay for that energy during the night when its own loads are

lower. The arrangement is entirely for the benefit of Wisconsin Michigan Power Company and does not operate to the detriment of the customer because the customer is able to carry on its operations and perform this interchange of energy at the same time.

This interchange, of course, does not occur during those times of the year when the customer is in need of firm power from the company, or when it is delivering surplus hydroelectric energy to the company.

The Examiner: Does the company get substantial 2720
amounts of energy through that interconnection and does it rely on it?

The Witness: No, it does not rely on it and the energy which the company receives through arrangements of this kind is surplus hydroelectric energy for the most part and must be taken into the system of the company at the time when Wisconsin Michigan Power Company already has more energy of that kind than it needs.

The reason that Wisconsin Michigan Power Com- 2721
pany is able to accommodate these customers, of which there are several delivering surplus energy into the company system, is that the systems are interconnected through to Appleton where the energy can be consumed, and on through to Milwaukee where there is still a larger market for those quantities of surplus hydroelectric power.

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If Wisconsin Michigan Power Company were operating alone, without interconnection to the south, its

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ability to absorb such quantities of surplus hydroelectric power would be greatly limited because it has such power in large quantities from its own plants at the same time that it is available from these interconnected plants.

Do you want the figures on it?

The Examiner: That answers my question.

The Witness: All right.

2723 *By Mr. Hamilton*:

Q. Is there anything unusual about the operation of these paper mills in terms of demands placed on the system requirements? A. It is very important that the power supply to a paper mill should be absolutely dependable. It is a difficult task to start a paper machine and it is very important after it is started that it be kept in operation until the run is finished.

Q. Do they operate on a 24-hour a day basis? A. Yes, they do. Most of the mills in the territory served by these companies, and I presume elsewhere, operate on a 24-hour
2724 basis as long as they have market for their output. It is considered a minor tragedy if something should happen to interrupt the operation of a paper machine while it is producing paper. The machines are very long and very complicated, and if a sheet is broken it ties up operations for sometime before it can be threaded through and started

again.

For that reason the supply of uninterrupted service to paper mills is very important and as I will point out in sub-

sequent testimony, Wisconsin Michigan Power Company considers its obligation to the paper mills in the vicinity of Appleton so great that although it may be able to carry the entire load in the Appleton area by means of power delivered from the hydro-electric plants in the north, it still operates the Appleton steam plant as spinning reserve to pick up that load on a moment's notice if anything should happen to interrupt the performance of the transmission line.

The Examiner: That is an automatic arrangement? 2726

The Witness: Yes, it is. The plant is floating on the system.

By Mr. Hamilton:

Q. Is it an expensive operation to start these mills going? A. Yes, it is. It takes time and once a mill is started they continue operating as long as they can. An interruption in service to a paper mill would be expensive.

Q. Are there advantages arising out of the load diversification in the systems of the three companies? A. Yes, 2727
there are. There are substantial advantages. May I return for a moment to the northern territory? I would like to say something about the iron mines that are served there. Wisconsin Michigan Power Company serves a large number

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of iron mines operating in the vicinity of Iron Mountain, Crystal Falls and Iron River. I don't know just how many mines up there are operating now. I do know, however, that there is much greater activity among them now than

there has been in recent years. There is a much higher demand for iron and steel products. These mines are unusual with respect to the service requirements they place on the electric system serving them. They use tremendous quantities of power.

The principal use of power in the mines in the territory served by Wisconsin Michigan Power Company is that of pumping water to keep the shafts dry so the crews can work. These mines go down to depths approaching 2,000 feet and
2729 immense quantities of ground water flow into the shafts and tunnels and that water must be pumped out or it would quickly flood the workings.

Possibly the heaviest load that is carried by electricity is that of compressing air for operating machinery used in doing the actual mining operations, that is the drills for drilling the holes to place the blasts are operated with air. The cars which pull the ore away from the face after it has been blasted, back to the hoist, are pulled with cables by means of air-operated winches, and in some of the larger mines they have small excavators which they call mucking
2730 machines, which scoop up the ore after it has been blasted loose from the face, and load it into the cars which are pulled back to the hoist.

The air compressors that compress this air are driven almost without exception by synchronous motors. That is

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a type of electric motor by means of which the power factor of the line serving the load can be controlled. These motors are usually over-excited, producing a leading power factor on the motor load, and off-setting the lagging power factor

on the hoist motor load, producing practically unity power factor on the entire load. Unity power factor is the most desirable relationship of voltage and current that could possibly be maintained on an electric system so far as efficiency of generation and transmission is concerned and the rates to these iron mines have a clause in them which gives the customer a lower demand charge in proportion to the extent to which his power factor is above 80 per cent.

In order to avail themselves of that reduced demand charge all of these companies operate their compressors on 2732
synchronous motors and use them as corrective power equipment.

Another relatively heavy use of electric service by these mines is that of hoisting the ore to the surface after it has been mined and loaded in the cars. The hoisting load——

Mr. Binford: (interposing) Mr. Examiner, the Commission has asked me to come down before them on another case for a few minutes. I wonder if we could take about a 15-minute recess?

The Examiner: Since it is almost 4:30 we will 2733
recess until tomorrow morning at 10:00 o'clock.

(Hearing adjourned at 4:10 p. m., to reconvene 10:00 a. m.)

—1,305—

2734 BEFORE THE

Securities and Exchange Commission

File No. 59-10

IN THE MATTER

of

2735 THE NORTH AMERICAN COMPANY, *et al.*

Hearing Room 1102,
Securities and Exchange Commission Building,
Washington, D. C.,
Tuesday, September 10, 1940.

Met, pursuant to adjournment, at 10:00 o'clock a. m.

2736 Before: W. W. SWIFT, *Trial Examiner.*

Appearances:

CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, Attorney for the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will come to order.

EDWARD H. SCHMIDTMAN resumed the stand and testified further as follows:

Direct Examination by Mr. Hamilton (Continued):

Q. Mr. Schmidtman, will you refer to Exhibit No. 34, Respondents' Exhibit No. 34? I believe you testified yester-
day that the seven customers shown under the caption "Wis- 2738
consin Gas & Electric Company, Other Electric Utilities," were all municipal electric utilities. Do you want to correct that statement? A. Yes, I do. Those seven customers include six municipalities to which Wisconsin Gas & Electric Company sells energy, and Wisconsin Power & Light Company, a non-affiliated electric utility, with which the system of Wisconsin Power & Light Company interconnects at two points in Walworth County.

Q. Now, at the conclusion of your testimony yesterday afternoon, you were in the process of describing the electric
service furnished by Wisconsin Electric Power Company to 2739
various iron mines in its territory. Will you proceed with that description? A. Yes. I was discussing the different ways in which the iron mines served by Wisconsin Michigan Power Company make use of electric service and was on the

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question of hoisting the ore out of the mines.

All of the mines in this district are of the shaft type, none of them being open pit or strip mines, and the hoisting of the ore from the working levels to the surface consumes appreciable amounts of electric power.

The loads imposed on the system of the company by this hoisting operation are somewhat variable and sometimes impose rather heavy demands on the company's system.

A fourth use of the electric energy made by the mines is that of lighting. It represents a relatively small proportion of the total amount of energy consumed by an iron mining customer. Because of the continuous loads which the mines have in doing their water pumping and air-compressing, many of these customers have load factors of 80 per cent. or
2741 higher.

One of the provisions of our rate is that the demand charge shall be lowered in proportion to the extent to which the load factor exceeds a certain set figure, so that with the combination of heavy use operating through the decreasing steps of the energy rate, and the benefit of the power factor correction, which I spoke of yesterday, as well as the load factor correction, these customers earn a very favorable rate for their power requirements.

Q. At the conclusion of yesterday's hearing I asked you whether there were any advantages arising out of the load
2742 —1,308—
diversification within the three companies and you answered that there were. Will you state what those advantages are? A. The advantages arising out of the diversification of loads served by the systems of the three companies operate to the benefit of both the companies and the customers. This diversification results in a much more steady type of load than would result from a situation where any one class of customers alone predominated on the system.

Because of this diversification resulting in more uniform demands, the companies are able to serve these com-

bined loads with facilities of lower generating and transmission capacity than they would be able to render the service with under other circumstances.

This means that each unit of generating capacity is able to serve more combined load because of the diversity in demands of the different classes of service.

Now, the diversification with respect to size of customers is very beneficial, particularly to the customers, because the high capacity equipment that is required to serve the large industrial plants can be operated at efficiencies much above 2744
that that could be attained in smaller units which would be required in serving customers with smaller loads.

In that manner, the customers, whose requirements are less than those of the industries, are able to share the benefits of the economies resulting from the larger plants and higher voltage lines and larger sub-stations which are re-

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quired in serving the heavier demands of the larger customers.

Diversification of load resulting in diversity of demands
and improvement of over-all load factor on the system is of 2745
distinct advantage in that it makes it possible for the utility system to render over-all service at lower unit cost and also makes it able to return those costs to the customers in the form of lower rates.

Now, the territory of the three companies operating in this area is unified with respect to power sources and is also unified to the extent that it is adequately and efficiently serving the composite loads represented by the entire service area.

Q. Turning now to the gas business, does Wisconsin Electric Power Company do any gas business? A. No. It has no gas business at all.

Q. Both Wisconsin Michigan Power Company and Wisconsin Gas & Electric Company do, however? A. Yes, they do.

Q. Will you refer to Respondents' Exhibit No. 32 and indicate for us the gas service territory of the Wisconsin Gas & Electric Company? A. The gas service area of Wis-
2747 consin Gas & Electric Company is not outlined on Exhibit 32, but it generally follows the routes of the gas transmission lines shown on the map. —1,310—

These lines are indicated by the dotted lines which have been colored yellow. All of the gas service territory of Wisconsin Gas & Electric Company, except 84 square miles, is within the electric service territory of Wisconsin Gas & Electric Company and Wisconsin Electric Power Company.

Those 84 square miles which are outside the electric service area of those two companies, lie in the southwest corner of Kenosha County and the southeast corner of Wal-
2748 worth County. That portion of the gas territory of Wisconsin Gas & Electric Company is within the area in which Wisconsin Power & Light Company renders electric service.

Q. And in that territory is the line or lines indicated on the map as connecting with Genoa City? A. Yes. The area in which Wisconsin Gas & Electric Company renders gas service, generally follows the course of the transmission lines.

Beginning at Racine where the principal gas plant of Wisconsin Gas & Electric Company is located, the gas service territory extends south through and including Kenosha and then west over to Genoa City.

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It also extends from Racine north to the south limits of Milwaukee, and west and north around Milwaukee to the east line of Waukesha County, then, continuing east into and through Waukesha, then north through Pewaukee, and west

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through Oconomowoc, continuing west to a point where a branch line runs north to the city of Watertown, continuing still further west with a branch extending to Lake Mills, and then south through Jefferson and Fort Atkinson to Whitewater. 2750

Another line runs west from Racine through Sturtevant, Union Grove, Waterford, and then northwest to Mukwonago, and then west through Eagle to the village of Palmyra.

The territory served by these lines includes the villages and cities through which the lines pass, and the adjacent rural territory in which service is rendered to customers who are within reach of the lines.

Q. And what is the square mileage of the gas service area served by Wisconsin Gas & Electric Company? A. It is 1,300 square miles.

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Q. And the population of that area? A. The population served in the gas service territory of Wisconsin Gas & Electric Company is 274,500. By "population served" I mean as in the case of the electric service area population, the population of the communities and rural districts to which gas service is available.

The average population density of this territory is 211 per square mile.

You will observe that that average falls between the average density of the electric service territory of Wisconsin Elec-

tric Power Company and the electric service territory of

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Wisconsin Gas & Electric Company.

Q. How many communities are included in the gas service territory? A. There are sixty-one communities, of which eleven are cities and fifty are villages and townships. The principal cities in the gas service territory are Kenosha, Waukesha, Watertown, Lake Mills, Jefferson, Fort Atkinson and Whitewater.

2753 I have excluded Milwaukee from this list, although Wisconsin Gas & Electric Company does render gas service to a few customers along the south limits of the city of Milwaukee. Gas service in Milwaukee, in general, is rendered by another gas company.

The cities that I have just named all lie within the electric territory of Wisconsin Gas & Electric Company.

Q. Are all except Lake Mills served by Wisconsin Gas & Electric Company with electric service as well? A. Yes, they are. In the case of Jefferson, the electric service rendered by Wisconsin Gas & Electric Company is at wholesale for
2754 resale on the municipal distribution system. Wisconsin Gas & Electric Company also renders gas service in four cities which are in the electric service territory of Wisconsin Electric Power Company.

Those include Racine, Cudahy, South Milwaukee, and Oconomowoc.

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Wisconsin Electric Power Company renders electric service in all four of these cities. In the case of Oconomowoc, however, the service is wholesale as the city operates a municipal distribution system.

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Q. Was the company originally solely a gas company? A. Yes, gas. Prior to 1912 the name of the company was Racine Gas Light Company. It operated a gas manufacturing plant and a gas distribution system in the city of Racine, and also a gas transmission line extending from Racine to Kenosha.

In 1912, the name of the company was changed to Wisconsin Gas & Electric Company and at that time it was engaged solely in the manufacture and sale of gas. Later in
1912, the property of the Kenosha Gas & Electric Company 2756
was acquired. This property included a gas distribution system and an electric distribution system in and around the city of Kenosha.

In 1915, the territory was expanded by the acquisition of a gas plant and a gas distribution system in Watertown. In 1923, the property of the Waukesha Gas & Electric Company was acquired. This property included a gas plant and a gas distribution system and an electric power plant and distribution system.

This property rendered service in the city of Waukesha
and in the surrounding area in Waukesha County. 2757

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In 1926, Wisconsin Gas & Electric Company acquired the gas and electric systems previously operated by the city of Fort Atkinson.

This property included a gas production plant and a gas distribution system in addition to the electric property.

Q. Have you data as to the number of customers served with gas service by Wisconsin Gas & Electric Company? A. Yes, I have. In 1912, when Wisconsin Gas & Electric Com-

2758 pany was serving in Racine and Kenosha only, that is after the acquisition of the Kenosha properties, the company was serving 11,820 gas customers and in that year it sold those customers 357,862 mcf.

By "mcf" I mean a thousand cubic feet. That is a standard unit of measurement of gas.

In 1926, the year of the latest acquisition, that of the Fort Atkinson property, the company was serving a total of 36,325 gas customers and its sales in that year amounted to
2759 1,482,099 mcf of gas.

From 1926 to the present date, no additional properties have been acquired and during that period the business of the gas system has been increased to where, at the end of 1939, it was serving 51,007 customers who consumed a total of 2,001,296 mcf of gas.

The gas sales of the system first exceeded two million mcf in 1929. Then they fell off to one and a half million

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mcf in 1933, and have since climbed to—or rather they
2760 climbed to over two million in 1937, since when the trend has been slightly downward.

Q. What is the area in square miles of the territory served by Wisconsin Michigan Power Company with gas service? A. Wisconsin Michigan Power Company renders gas service in an area of 61 square miles. This area includes the cities of Appleton, Neenah, and Menasha, and a band of suburban territory lying along the gas transmission line connecting the cities.

The transmission line is shown by the line of dashes appearing on Exhibit 32 between Appleton and Neenah.

Q. What is the population of the area served with gas service? A. The population of the gas service territory of Wisconsin Michigan Power Company is 53,188. The three cities in that territory have a total population of 50,000 and the remaining population of 3,188 is located in the suburban territory lying between the cities.

This entire gas service territory is within the territory in which Wisconsin Michigan Power Company renders electric service.

Both Appleton and Neenah receive retail electric service 2762
from the company, but the city of Menasha has its own electric system to which the company sells energy wholesale.

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Q. Have you data on the number of customers served by Wisconsin Michigan Power Company with gas service? A. In 1923, the year in which continuously available records begin, the gas system was serving 6,583 customers and sold 174,986 mcf. The number of customers applies to the end of the year 1923 and the sales within the year.

In 1923, this system was operated by Wisconsin Traction,
Light, Heat & Power Company. 2763

Q. That is a predecessor company of the Wisconsin Michigan Power Company, is it? A. Yes, it is.

In 1927, the year in which Wisconsin Michigan Power Company came into existence, the system was serving at the end of the year 8,258 customers who consumed 232,909 mcf. of gas. In the year 1930, the system reached its maximum annual sales.

At the end of that year it was serving 9,262 customers and the total sales amounted to 264,857 mcf. Since that time

2764 the volume of sales has gradually declined, although the number of customers hasn't changed materially.

At the end of 1939, the system was serving 9,239 customers, who consumed 207,829 mcf. of gas.

The gas business on this system is continuing to decline.

Q. Previously, you located very briefly the transportation territory of the Milwaukee Electric Railway and Transport Company, the transportation subsidiary of Wisconsin

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2765 Electric Power Company. Will you be a little more specific in locating that territory by names of towns served? A. The Milwaukee Electric Railway and Transport Company now renders street railway and auxiliary gasoline feeder bus service in the city of Milwaukee, the village of Shorewood, the village of Whitefish Bay, the village of Fox Point, the city of Wauwatosa, the city of West Allis, the city of West Milwaukee, the city of Cudahy, and the city of South Milwaukee.

Q. All those towns are designated, are they, on Exhibit No. 32? A. Yes, they all appear.

2766 The company also renders electric trolley bus transportation service in the city of Milwaukee. Our trolleys are overhead, however, rather than underground as you have them here with your street cars in Washington, and that trolley bus service requires double trolleys, inasmuch as the busses travel on rubber tires and have no connection with the ground.

The company also operates an interurban electric railway system with lines reaching from Milwaukee to Port Washington, from Milwaukee to Watertown, from Milwaukee to Hales Corners, and from Milwaukee to Kenosha.

The Milwaukee-Port Washington line, until quite recently, extended as far north as Sheboygan, Wisconsin, which does not appear on the map. It is located a few miles

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north of Weedens, which is the point at which the northernmost railway sub-station of the company is situated.

Sheboygan is on the shore of Lake Michigan, east and a trifle north of Plymouth.

The service was recently cut back to Port Washington, 2768
due to poor operating results, and bus service was substituted from Port Washington to Sheboygan.

The interurban cars now run as far north as Port Washington and turn around at that point.

The Milwaukee-Watertown line is still in existence but the rail service extends west only as far as Oconomowoc. Beyond Oconomowoc transportation service is rendered by means of gasoline busses and although the rail service from Oconomowoc to Watertown has been discontinued, the tracks haven't yet been removed.

The line to Hales Corners, which is just a few miles south- 2769
west of Milwaukee, formerly extended over two branches, one leading to Mukwonago and East Troy, the latter city being located in Walworth County, and the other extending to Burlington, which is located in the southwest corner of Racine County.

Both of these branch lines have been abandoned and now the rail service extends only as far as Hales Corners. In abandoning the rail service to East Troy and to Burlington,

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the company would have been required by the Public Service

2770 Commission of Wisconsin to substitute gasoline bus service for the convenience of the public, but it happened that another bus line which was operating in this vicinity was willing to take over those routes and it is now rendering service that was previously rendered by the interurban rail lines.

The rail line to Kenosha passes through the cities of Cudahy and South Milwaukee, as well as though Carrollville, and through the city of Racine. This line is one of
2771 the best operating lines of the entire interurban system, and there are no plans in mind at present for discontinuing any of that service.

Q. Does Wisconsin Gas & Electric Company do any transportation business? A. Yes; Wisconsin Gas & Electric Company operates a number of electric trolley busses in the city of Kenosha. The service rendered there is purely an urban transportation service. It has no interurban lines and has no transportation service in any other city.

Q. And Wisconsin Michigan Power Company, does it have any transportation business? A. Yes, Wisconsin Michi-
2772 gan Power Company now operates gasoline busses in the city of Appleton and between Appleton and Kimberly. Wisconsin Michigan Power Company formerly operated street cars in

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Appleton and an interurban rail line to Kimberly, but the rail service was discontinued and gasoline bus service substituted.

Q. Which companies do a steam business? A. Wisconsin Electric Power Company does some steam heating business. The area in which it renders steam heating service is in the

heart of the business district of the city on both sides of the Milwaukee River.

Most of the service is rendered to large office buildings, hotels and public buildings.

Wisconsin Gas & Electric Company also does a steam heating business which is of rather small magnitude. These operations are carried on entirely in the city of Waukesha and are an outgrowth of the business that was acquired when the property of the Waukesha Gas & Electric Company was purchased. 2774

Wisconsin Michigan Power Company does no heating business.

Q. So far your testimony has related to the outlines of the territory served by the respective companies in the various businesses in which they engage.

Turning now to the actual physical properties of the companies, would you state what the aggregate book value of the investment of Wisconsin Electric Power Company, Wisconsin Gas and Wisconsin Michigan Power Company is on electric property? A. Yes, the total book value of the

—1,321— 2775

electric plant in service of the three companies at the end of 1939 was $140,315,612.00.

Q. And what are the major classifications of properties? A. The major classifications of the property include twenty power generating stations with a total rated generating capacity of 539,080 kilowatts at the present time.

Q. By that aggregate figure you mean to include only plants now in operation and available or available for operation, and you are excluding, are you not, projected plants

or plants under construction? A. Yes, that is right. This generating capacity represents the installed rated generator capacity now in place and either in operation or available for operation at the present time.

The second general classification of electric properties is the transmission system which comprises 1,896 miles of line interconnecting the power plants and feeding the distribution system.

The tra' smission system includes thirty sub-stations with
2777 a combined installed capacity of 702,025 k. v. a. The distribution system of the three companies includes 10,590 miles of pole line, 204 miles of underground lines, 170 sub-stations, with an aggregate installed transformer capacity of 573,486

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k. v. a. and 43,532 line transformers whose combined capacity is 422,977 k. v. a.

Q. All figures which you have just given relating to electric plant and property are figures for the combined Wisconsin Michigan group, are they not? A. Yes, they are.

Q. What are the generating stations of the Wisconsin
2778 Electric Power Company? A. Wisconsin Electric, Power Company has five generating stations, having a combined installed generator capacity of 479,500 kilowatts. These are all steam plants.

In order of size their individual capacities are as follows:

Lakeside Plant, 310,800 kilowatts; Port Washington, 80,000 kilowatts; Commerce Street Plant, 51,500 kilowatts; Racine Plant, 23,500 kilowatts; and the East Wells Street Plant, 13,700 kilowatts.

Q. Will you now describe the East Wells Street Plant? A. The East Wells Street Plant is the plant in which the newest boiler and the newest generating unit on the system are installed.

The plant contains only this one generating unit which is a turbo-generator rated at 13,700 kilowatts.

The steam turbine operates at a steam pressure of 640 pounds per square inch, and a steam temperature of 825 degrees Fahrenheit.

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The boiler plant burns pulverized coal exclusively. The generating unit went into service in 1939. This plant is located in downtown Milwaukee in the heart of the business district. It is situated on the east bank of the Milwaukee River which furnishes water for cooling the condenser.

I might add here, that boiler make-up water is taken from the municipal water system. The plant furnishes steam for the steam heating system in the East Side business district and also generates electrical energy for distribution in the downtown area.

The plant is in regular operation and during the heating 2781
season it is in continuous operation. The steam, which is delivered to the turbine at 640 pounds per square inch, is expanded in passing through the turbine and is exhausted at twenty-pounds pressure into the high pressure heating system.

From there it is transmitted through the heating mains and service connections to the heating customers.

Now, the plant also operates during seasons of the year outside of the heating season. If it weren't capable of

doing that, it would have to stand idle during the entire summer.

In order to make it unnecessary to shut the plant down or to operate uneconomically when the heating system require-

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ments so low, the plant has been equipped with a condenser into which the turbine exhausts when the exhaust steam is not needed for the steam system.

This condenser, as I explained, is cooled by water pumped
2783 in from the Milwaukee River. The present boiler went into service before the turbo-generator was completely installed. The boiler was completed and began operating in 1938.

It took over the load, that is the steam heating load, of six old boilers located in what we previously called the Oneida Street Plant, which is in a building adjacent to the building in which the new boiler plant is located.

In 1938, the boiler rendered steam heating service only, but in 1939, when the turbo-generator went into operation, then the boiler plant delivered steam to the turbine and through it to the heating system.

2784 The six boilers in the old Oneida Street Plant which were replaced by this new boiler, originally served the Oneida Street generating station, whose generating equipment has since been taken out of service and replaced with a new unit.

The old Oneida Street Station was the first central station in Milwaukee and when it went into operation, it took over the loads of a number of small scattered, inefficient plants, which had been acquired by Wisconsin Electric Power Company during the process of integrating the isolated systems then operating in the Milwaukee district.

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The original boiler plant and the generating equipment in the Oneida Street Plant operated until 1930, furnishing steam and electricity for the same area which is now served by the new plant.

In 1930 the generating equipment was taken out of service but the boilers were continued in service until 1938 when they were relieved of their load by the new boiler plant.

The reasons for making the installation of this new boiler, and the new turbo-generator, at this location, were two-fold: First, the load on the steam heating system in the 2786
East Side business district had grown to a point where the old boilers were incapable of carrying it safely and efficiently; and, second, the requirements for electrical service in the downtown area had also increased to such an extent that there was definite need for additional generating capacity in that district.

The new plant which was installed at a cost of about $1,800,000.00 meets both these requirements. It realizes the economy that can be achieved from using steam, first, for generating electricity, and then for serving steam heating customers. 2787

The use of steam for generating electricity, first, does not detract from its usefulness for heating purposes. It simply involves a matter of giving the steam more heating energy than it needs for heating purposes and taking that heat

energy out of it by electrical generation.

As I have explained, this steam is delivered to the turbine at 640 pounds and then is expanded to twenty pounds where it goes into the heating system. At that point it is

just as useful for heating purposes as it would be if it were generated in a boiler plant which generated steam at twenty pounds.

The economy that is realized through this joint operation arises from the fact that the heat which is put into the steam above that remaining when it goes into the heating system, is available for electric generation, and the residual heat that is left in the steam when it is exhausted, is still available for heating purposes.

2789 Q. You said the installation of the unit in East Wells Street resulted in savings. Is that savings which can be translated into dollars and cents? A. Yes, it is. The saving which I was speaking of is one that is inherent in the type of operation that is practiced at the plant. We have made no attempt to evaluate that saving but a more measurable saving has been made by the new installation in comparison with the cost of operation experienced in the old boiler plant and in the other generating stations of the company as a whole.

During the twelve months ended February, 1940, the
2790 steam produced for heating purposes and the electricity produced for distribution at the new East Wells Street Plant

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were produced at a cost of approximately $130,000.00 less than the cost would have been had that same amount of steam been generated in the old East Wells boilers and the same amount of electricity generated in all the other plants of the companies on an average cost basis.

Those figures don't purport to show the saving resulting from the combined operation of electric and steam heating uses, but rather to show the savings realized from the plant

because of its higher economy than that of other facilities of the company.

Q. Will you describe the Commerce Street generating station? A. The Commerce Street generating station now has an installed generator capacity of 51,500 kilowatts. That is 6,400 kilowatts less than the installed capacity was on December 31, 1939.

I point that out because I have already given a figure representing the total installed generator capacity of all companies as of the present time and subsequently I will use 2792
a figure representing the total installed generating capacity of the three companies of the Wisconsin Michigan group at the end of 1939 and I wanted to point out this change in the capacity of the Commerce Street Plant so there would be no apparent discrepancy in my figures.

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The present capacity of the plant is made up of seven generating units. Two of them are rated at 2,000 kilowatts each and generate 600-volt direct current energy.

These units are driven by vertical cross compound Corliss engines which operate at a steam pressure of 180 pounds per 2793
square inch, and a steam temperature of 400 degrees Fahrenheit.

These units went into service in 1905 and are the remaining two of four such units which were installed at that time.

Previously, there were also four other engine-driven units rated at 1,500 kilowatts each and which generated 25-cycle current, but those have since been removed.

Two of the present units in the Commerce Street Plant are rated at 7,500 kilowatts each. They are turbine-driven generators which generate energy at 25 cycles.

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The turbines operate at a pressure of 1.3 pounds gauge per square inch, and a temperature of 220 degrees Fahrenheit. They were installed in 1911. These units were installed for two reasons.

First, there had been a rapid increase of load in the area served by the Commerce Street Plant; and, second, the eight engines which were then in service had been installed and designed to operate so as to exhaust their steam into the heating system. —1,329—

2795 It was found, after operating a short period of time, that the eight engines produced more exhaust steam than the heating system required and in order to carry the electrical load on the generators, it was necessary to exhaust this steam into the atmosphere and waste the heat energy contained in it.

In order to supply part of the need for increased electric generating capacity and to supply the means of utilizing the steam being exhausted from the engines in excess of requirements of the heating system, these low pressure turbines were installed. They take the steam at a gauge pressure of 1.3 pounds per square inch and exhaust it into condensers which
2796 are cooled with water pumped in from the Milwaukee River.

I should have explained that Commerce Street Station is located on the Milwaukee River on the opposite side and somewhat upstream from the East Wells Street Plant.

The heating system which is served by the Commerce Street Station is entirely on the west side of the Milwaukee River. There is a connection through between the plants, but normally the East Wells Street Plant serves the east side heating load and the Commerce Street Plant serves the west side heating load.

In 1911 there was also installed one unit rated at 14,000 kilowatts. This unit is turbine driven and generates 60-cycle

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alternating current energy.

The turbine operates at a throttle pressure of 200 pounds per square inch and a throttle temperature of 450 degrees Fahrenheit.

Another similar unit was installed the following year—that is, in 1912. These two units were installed purely for
the purpose of keeping the plant ahead of load requirements 2798
in the area it was serving.

In 1913 another 60-cycle turbo-generator was installed, having a rated capacity of 4,500 kilowatts. In the same year there was also installed in the Commerce Street Plant a small 250-volt direct current unit which was moved over from the old Oneida Street Plant across the river.

That unit is no longer in service, but I mention it here to support the statement that the maximum installed capacity of the Commerce Street Plant was reached in 1913. That capacity was 61,900 kilowatts.

The Commerce Street generating station was the com- 2799
pany's principal power plant for a number of years. The entire capacity of 61,900 kilowatts remained in service until 1933 when two of the four original vertical engines were removed with their generators—no, that is not correct. In 1933, two of the four original engines were converted to single expansion operation in order to provide more steam for the heating system.

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That reduced their rating from 1,500 kilowatts each to 900 kilowatts each. The use of 25-cycle service on the company's system was being reduced according to a program

carried out by the company, and as a result of that program, one of the four original units was taken completely out of service in 1937, and the following year one of the single expansion units was removed, and then the four hundred kilowatt unit, which I mentioned as having been moved over from Oneida Street, was also taken out in 1939.

The continued upward trend of loads in the downtown area of the city, accompanied by the continued increase of the heating load in that district, has made it necessary for
2801 still further additions to be made to the plant.

Plans have been laid for a new high-pressure boiler and turbo-generator to be installed in the Commerce Street Station. Authority was obtained from the Public Service Commission of Wisconsin and work on the installation of the boiler plant and turbo-generator unit was begun in 1939.

This boiler plant is being installed in a new section of the building on the north end of the existing power plant building, but the generating unit is going to be placed in the existing power plant building and room for it is being provided by the removal of the two remaining engine-driven
2802 —by the removal of two of the remaining engine-driven units, and two of the 2,000 kilowatt engine-driven units.

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Those removals which were made in 1939 represent a total of 6,400 kilowatts and lowers the plant capacity to its present figure of 51,500 kilowatts.

Q. Giving effect to the completion of the operation of the new unit, what would be the rated generating capacity of the Commerce Street Plant? A. The rated generator capacity of the plant, after the new 35,000 kilowatt unit is in service, will be 86,500 kilowatts.

The new boiler will generate steam at a pressure of 1,230 pounds—that is, it will deliver steam to the generating unit at 1,230 pounds and a temperature of 900 degrees Fahrenheit.

The furnace will burn pulverized coal exclusively and the boiler plant will have a rating of 375,000 pounds of steam per hour.

The turbo-generator will be of the extraction condensing type. By that I mean that it will be designed to operate in such way that steam can be extracted from the turbine
at various stages of expansion, such extracted steam to be 2804
used in the heating system.

The turbine can also be operated to discharge its exhaust into a condenser, in which case the maximum amount of energy in the steam will be utilized in generating electrical power.

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The condenser will be cooled by circulating water drawn from the Milwaukee River. When the unit is carrying an electrical load of 35,000 kilowatts, it will be capable of delivering 100,000 pounds of steam per hour for heating purposes. The maximum extraction that can be made will be
240,000 pounds per hour, at which time the turbine will be 2805
capable of carrying the load of 24,000 kilowatts on the electrical generating end of the unit.

The maximum extraction of 240,000 pounds per hour will furnish steam equal to the steaming capacity of the original eight boilers installed in the Commerce Street Plant.

Those old boilers will then be taken out of service and will be re-rated to operate at a lower pressure and will be used purely as stand-by steaming capacity for the heating system.

They are not to be dismantled immediately.

Now, I mentioned that the boiler will burn pulverized coal. The boiler installed in the East Wells Street Plant also burns pulverized coal and it replaces the old boilers in the Oneida Street Plant which were used in 1919 to conduct a series of pioneering experiments in the use of pulverized coal in central station boilers.

Those experiments were conducted by the combustion engineering corporation, representatives of the United States
2807 Bureau of Mines and representatives of Wisconsin Electric

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Power Company.

They were quite revolutionary in the field of power generation and the results indicated considerable increases in efficiency in boiler operation. Some of the tests that were conducted at that time showed improvements of four points over the highest efficiencies theretofore obtained in any central boiler plants.

As a result of those experiments which were the first ones carried out on that scale and carried out to an extent
2808 that supported conclusions to the effect that the use of pulverized fuel was practical in central station boilers, really paved the way for the design of the modern pulverized fuel boilers which are being installed in some of the modern generating stations today.

(Discussion off the record.)

The Examiner: I think this is a good point to have a recess. We will take a five-minute recess.

(Whereupon a short recess was taken.)

The Examiner: All right.

The Witness: Continuing with the discussion of the Commerce Street Power Plant, I would like to point out that the reasons for the current additions being made to the plant are the same as those for which the new unit and boiler plant were installed in the East Wells Street Station—that is, increased demand for electric service and increased require-

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ments for heating service in the business district 2810
of the city of Milwaukee.

Before deciding to make the installation at Commerce Street, however, extensive investigations were made to ascertain the best means of meeting those requirements.

Of course, the requirements for more steam in the
heating area could be met only by boiler plant ca-
pacity installed within reach of that system and the
studies contemplated boiler plant installation purely
for the purpose of furnishing steam at that location
and the possibility of installing additional electrical 2811
generating capacity at various other points on the
company's power system.

One of the points considered for the location of the generating capacity was Kenosha because Racine and Kenosha are now served very largely by a high-voltage transmission line which I will describe later, and it was felt there might be justification for the purpose of increasing reliability of service or rather reducing the likelihood of interruptions in the Racine-Kenosha

2812 district by installing generating capacity on that part of the system.

In spite of that advantage, however, it was found that the economies that could be achieved by the combined operation for generation and heating purposes, that the decision to install the boiler plant and unit at Commerce Street was reached.

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The present installed capacity of the Commerce
2813 Street Plant, excluding the new unit which is going in, is 51,500 kilowatts, but the plant is incapable of carrying that great an electrical load during the peak load season.

The reason for this is that the requirements of the heating system for steam utilize such a portion of the boiler plant capacity that the boilers are unable to furnish enough steam in addition to that to carry the electric generating units at full load.

We consider the dependable heat load capacity of the Commerce Street Plant during the winter sea-
2814 son, when the heating loads were high, to be 28,000 kilowatts.

When the current additions have been completed, the total available boiler capacity will be appreciably increased and the dependable generating capacity of present equipment will be increased to about 30,000 kilowatts.

When the new unit is added, representing an additional 35,000 kilowatts, the total dependable capacity of the Commerce Street Plant will be 65,000 kilowatts.

That figure should be distinguished from the total installed capacity of 86,500 kilowatts at that time.

By Mr. Hamilton:

Q. Before leaving the Commerce Street Plant, I don't believe you have told us the steam pressure and the steam temperature at which the 4,500 kilowatt unit installed in

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1913 operates. Will you give those figures? A. Yes, I will. 2816
I must have overlooked that information.

The 4,500 kilowatt unit installed in 1913 is a turbine-driven generator which generates 60-cycle alternating current energy. The turbine operates at a throttle pressure of 180 pounds per square inch and a steam temperature of 450 degrees Fahrenheit.

Q. In this plant, taking into account the new addition, there appear to be variations in steam pressure as between the respective units from 1.3 pounds to 1,200 pounds in the case of the new unit. Can you explain the wide variation in addition to your preliminary explanation of the 1.3 steam 2817
pressure? A. The original generating units in the plant operated at 180 pounds pressure. That was considered a reasonable and economical operating pressure for engines of that type at that time, and the boilers were designed to deliver steam at that pressure.

The 7,500 kilowatt units, as I have explained, were designed to operate at the unusually low pressure of 1.3 pounds per square inch in order to utilize the exhaust steam from the eight engines then in service.

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The 200-pound pressure units installed in 1911 and 1912 are considered to operate at essentially the same pressure as

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the eight engines previously installed and the 4,500 kilowatt unit subsequently installed. The difference of twenty pounds doesn't throw the two into different general pressure classes.

Now, the decision to install the new boiler and turbo-
generator to operate at 1,230 pounds pressure is based on
2819 experience that has subsequently been gained in the installa-
tion and operation of units on the high-pressure cycles.

There is considerable economy to be realized through the use of high pressures and high temperatures, inasmuch as there is a certain residual heat in the steam when it is discharged from the bottom stage of the turbine. That amount of heat can not be reduced below a certain practical minimum.

There is also a certain amount of heat lost through radi-
ation. The radiation losses will naturally vary somewhat
with the temperature and pressure, but they are kept to
2820 practical minimum values by insulation.

Now, then, above those relatively fixed losses is the range in which the heat which is put into the steam is useful in generating mechanical power in the turbine and subsequently electrical power in the generator, so that the more heat energy that is stored in the vapor above the margin which is certain to be lost, the greater is the percentage of useful heat in the steam.

Now, the art has been developed to the point where pres-

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sures are now in the 1,200 to the 1,300 pound range. I have no doubt that we will have still higher pressures in the future, unless some entirely revolutionary method of converting heat to electricity is discovered and developed to a practical basis.

It is expensive to use high pressures and high temperatures. Operating difficulties not encountered in low-pressure and low-temperature boilers occur regularly in these high pressure units. Difficulties are encountered in the operation of the turbines, but in spite of those difficulties and in 2822
spite of the higher investment required because of the more difficult and more exacting construction of the equipment, the additional economy justifies the expenditure in instances where the fuel cost is not so low that the saving does not off-set the additional cost.

Our companies are in an area where fuel costs are somewhat higher than they are in certain other parts of the country and those higher fuel costs make it economical for us to use the high pressures and the high temperatures when the loading conditions and other operating conditions lend themselves to that type of operation. 2823

These decisions to go to the higher pressures were not made lightly. Most extensive studies were made and, as I will point out when we come to the Lakeside Plant, we have had as great experience as any utility operators in the

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country in the operation of high-pressure and high-temperature equipment.

Q. Will you now describe the Racine Power Plant? A. The Racine Power Plant is a steam generating station lo-

cated in the city of Racine on the shore of Lake Michigan near the mouth of the Root River.

It has an installed electrical generating capacity of 23,500 kilowatts, consisting of three turbo-generator units which generates 60-cycle alternating current energy.

The units all operate at 200 pounds pressure and 530 degrees Fahrenheit temperature.

The boilers which supply the steam for the turbines are stoker-fired. The present units in the plant are the ones
2825 which remained in place after the period of additions and removals which the plant has gone through.

The plant was acquired by Milwaukee Light, Heat and Traction Company, a non-operating affiliate of Wisconsin Electric Power Company, in 1919. At that time it was a part of the property—I should say it was acquired from, not by, Milwaukee Light, Heat and Traction Company in 1919. It was a part of the utility operating property of Milwaukee Light, Heat and Traction Company at that time.

The plant was constructed by a previous owner and was acquired by Milwaukee Light, Heat and Traction Com-
2826 pany in 1899. Its original function was to generate energy at

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600 volts direct current for use of the street railway system in Racine.

The owner of the plant also operated the railway system at that time. After it was acquired by Milwaukee Light, Heat and Traction Company, it was expanded in order to carry the increasing loads on the railway system and by 1910 the plant capacity had increased to 3,500 kilowatts of 600-volt direct current generating capacity.

Additional units were installed and other units were removed, so that at the present time the three units consist of one rated at 35,000 kilowatts, which was installed in 1915——

Q. (Interposing) 3,500. A. You are right. 3,500 kilowatts —(continuing) which was installed in 1915, one rated at 10,000 installed in 1917, and one rated at 10,000 installed in 1919, making a total present installed generator capacity of 23,500 kilowatts.

The Racine Plant is not in regular electric operation. The 2828
boilers are in continuous operation, however, and furnish steam for the operation of the gas production plant of Wisconsin Gas & Electric Company which is located nearby.

The electrical generating equipment is operated periodically, purely for the purpose of making sure that it is in operating condition and is available to pick up load in case of an emergency on the system.

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Being located in Racine, the plant represents not only available reserve capacity for the entire system, but it also constitutes a valuable stand-by for guaranteeing continuity 2829
of service in the Racine and Kenosha district in case of an outage on the transmission line from Lakeside which furnishes most of the power consumed in that area.

Q. Its maintenance as reserve capacity is necessary for the Wisconsin Electric System? A. Yes, it is. By that I mean it is an essential and important part of the reserve capacity of the system. It is always included as available capacity in computations pointed toward the determination of whether our capacity is sufficient to carry our loads with an adequate margin of reserve, and inasmuch as it is recog-

nized as available reserve in such analyses, and is considered reserve in operating the power generating facilities of the company, it is kept continuously ready to start up and carry load.

The units are not kept spinning all the time, however, and it would take a short time to get the units warmed up so that they could carry load. It is still available and we consider it as load reserve.

Q. What is the function of the steam which that plant
2831 furnishes to the Racine Gas Works of the Wisconsin Gas & Electric Company. A. The steam that is used in the gas works is used for quenching purposes and for heating the

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gas holders. They are the water sealed type holders and the seal must be kept free from ice, otherwise, the holders would be frozen tight and wouldn't operate in the winter time.

During our extreme winters we have ice on open streams and open bodies of water that sometimes reaches a thickness of two or three feet and the water seal on a gas holder will quickly freeze up and then the top of the holder wouldn't be
2832 able to rise and fall as it received and delivered gas.

Q. Will you describe the Lakeside Generating Station? A. The Lakeside Generating Station is the largest power plant owned and operated by Wisconsin Electric Power Company, and is also the largest power plant in the combined systems of the three companies of the Wisconsin Michigan group.

It has a total installed generator capacity of 310,800 kilowatts. This capacity comprises twelve turbo-generator units, all of which generate 60-cycle alternating current. All of the boilers in the boiler plant burn pulverized coal exclusively.

The oldest unit in the plant is one rated at 20,000 kilowatts which was installed in 1920. It operates at a throttle pressure of 290 pounds per square inch and a temperature of 700 degrees Fahrenheit.

The next unit installed went into service in 1921. It is

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also rated at 20,000 kilowatts and also uses steam at 290 pounds pressure and 700 degrees.

The third unit which is rated at 30,000 kilowatts was
installed in 1922. It operates at the same pressure and tem- 2834
perature as the two 20,000 kilowatt units.

Two more 30,000 killowatt units went into service in 1924, operating at 290 pounds pressure and 700 degrees.

In 1926, a fourth 30,000 kilowatt unit operating at the same pressure and temperature was installed.

Also in 1926, there was installed one unit rated at 7,700 kilowatts which operated at a throttle pressure of 1,230 pounds per square inch and temperature of 750 degrees.

In 1928, one 60,000 kilowatt unit and one more 7,700 kilowatt unit were installed.

The 60,000 kilowatt unit operated at 290 pounds pres- 2835
sure and 700 degrees, while the 7,700 kilowatt unit operates at 1,230 pounds and 750 degrees.

In 1930, another 60,000 kilowatt unit operating at 290 pounds, and 700 degrees, as well as two 7,700 kilowatt units, operating at 1,230 pounds throttle pressure and 750 degrees temperature, were installed.

The Lakeside Plant is located at St. Francis which does not appear by name on Exhibit 32. The location of the plant is shown by the name Lakeside Power Plant, and is about one

mile south of the city limits of Milwaukee on the shore of
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Lake Michigan.

Construction of the Lakeside Plant was first considered in 1915. I have described how the increasing load requirements on the system caused the company to make successive additions in the Commerce Street Plant and you will recall that the Commerce Street Plant first reached its ultimate capacity in 1913.

2837 Only two years later the company considered the construction of another power plant. Plans were laid and designs were drawn for the original Lakeside Plant in 1915 and 1916, but when the United States entered the World War, conditions became such that it was difficult to finance the construction of a project of that magnitude and the plans were temporarily shelved.

The loads continued growing, however, during that period and the company resorted to obtaining power from all possible sources, including the purchase of power from isolated private plants located in the territory.

2838 At the end of 1919, however, the demands were so nearly equal to the total capacity available for generating power that it wasn't possible to postpone the construction of the plant any longer.

The original plans were revived and revised. Construction was begun on the plant in 1920.

Now, the studies that were originally made in 1915 to de-
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termine what size plant should be built and where it should be located, indicated that it would be desirable to build a

new plant rather than install additional capacity in plants then in operation.

The loads on the system south of the city of Milwaukee had been growing substantially in the communities of Cudahy and South Milwaukee and down in Racine and Kenosha. For that reason a location south of the city of Milwaukee received preference.

Another point which led to the decision to locate the Lakeside Plant where it was located, is the availability of an unlimited supply of cool water in Lake Michigan. In a 2840
modern steam plant, somewhere between 700 and 900 tons of water are pumped through the condensers for every ton of coal that is burned and with a plant of the size which Lakeside was expected to ultimately reach, a supply of cold water was quite essential.

Lakeside was not located on the lake in order to receive coal from lake boats, but it was located there largely because of the presence of the plentiful supply of cooling water and it was located south of the city because of the tendency of the loads at that time to be developing in that direction.

Between 1915 and 1930, when Lakeside went into con- 2841
struction, the experiments in pulverized fuel which I previously mentioned, were conducted at the Oneida Street Plant,

and the possibility of using such fuel successfully in central station boilers had been demonstrated, so the plans for the Lakeside Plant which had previously been prepared were revised to provide for the exclusive burning of pulverized fuel in the boilers in that plant.

The first section that went into operation was completed late in 1920 and it was the first plant in the world of that

capacity to utilize pulverized coal exclusively as a fuel. The decision to use pulverized coal was made quite widely known through its revolutionary nature, and renowned engineers and well established engineering periodicals were unanimous in the opinion that it would be a dismal failure.

We have ~~quite a~~ bibliography in our plant department of articles and quotations by people who were unquestionably authorities in the field of power generation who felt that the company was being most unwise in making such an invest-
2843 ment in such a revolutionary development.

That decision required considerable fortitude but it was made. The plant was built and went into operation and its subsequent history has demonstrated that that was one of the pioneering achievements in the field of power generation.

Now, when I speak of pulverized coal, it might be illuminating to tell just a little what it is like. Pulverized coal as burned in modern pulverized fuel boilers is coal that has

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been ground to a fineness such that approximately two-thirds of it will pass through a sieve with two hundred openings per
2844 inch, or forty thousand openings per square inch. That is, there are two hundred wires in each lineal inch.

That would mean that there are two hundred times two hundred which would be 40,000 openings in one square inch of the screen. Approximately two-thirds of the pulverized coal will pass through a screen of that fineness.

A screen that fine will hold water if it isn't under pressure. When mixed with air, this extremely fine coal dust forms an explosive mixture and if it is ignited under certain conditions it will explode with the violence of gun powder

and that characteristic of the fuel was one of the reasons why the predictions were so unanimously in the direction of failure.

Pulverized fuel had previously been used quite extensively in such operations as cement kilns and refractories and other operations where the heat of the combustion was consumed directly in the manufacturing process without first going through the medium of steam, but never before had it been used successfully on that scale in the generation of steam in central station boilers. 2846

The pulverized coal is mixed with air by means of carefully controlled apparatus and is supplied to the boilers as

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a mixture of air and coal in which the air content is not quite sufficient to accomplish complete combustion. It is blown in. It is handled by air fans and blown into the boiler through nozzles.

When it reaches the boiler it encounters an uprising current of air which is furnished by other fans, and which furnishes the quantity of air required to complete the combustion. 2847

The nature of the fuel and the ease of controlling the delivery makes its operation very flexible. It also results in more nearly complete combustion of the coal—that is, less of the fuel value is wasted in the furnace, and it lends itself to more completely automatic operation, eliminating or minimizing the human element, and facilitating accurate adjustment and control of the delivery of coal and air.

During the first months of operation of the Lakeside Plant, difficulties were encountered, as would be expected

in a plant as revolutionary as that, and as a result of those difficulties, the unit heat consumption per kilowatt hour of net output was somewhat above 20,000 B. t. u.

By B. t. u. I mean British Thermal Unit, and in my subsequent testimony I will use the term B. t. u. with that meaning.

By the middle of 1921, the plant was operating quite smoothly. Most of the difficulties had been fairly well ironed

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2849 out and the heat consumption had been reduced to 19,000 B. t. u. per kilowatt hour of net output.

At this point I should also explain what I mean by net output. The total energy generated in a steam generating station may be measured at the terminals of the generator. That energy represents the over-all electrical energy produced in the plant.

Some of that energy is consumed in operating the plant, itself, in driving—in the case of Lakeside—the coal conveyors, the pulverizing mills, the draft fans, the boiler feed water pumps, the condensing water pumps, and various

2850 other auxiliary equipment in the plant.

After the consumption of those auxiliary uses has been deducted from the gross generation of the generators, the remaining difference which is available for delivery to the transmission or distribution system and is measured by the kilowatt hours on the plant switchboard is what I mean by net kilowatt hour output.

System loads continued to grow and, as I have previously pointed out, a 30,000 kilowatt unit was added in 1922 bringing the total installed capacity to 70,000 kilowatts.

In 1924, two more 30,000 kilowatt units were added and a second section of boiler plant was installed. Up to this time, the first section of boiler plant had been able to supply all of the generators installed in the plant, but when the

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two 30,000 units were installed in 1930, it was necessary to add to the boiler plant and at that time a second contribution to the field of power generation was made at the Lakeside Plant.

Q. Did I understand you to say this was 1930? A. No; 2852
1924. If I said 1930, I misstated myself. 1924.

This second contribution was the installation of radiant superheaters in the boilers. The boilers previously installed in the plant were equipped with convection superheaters which utilized heat from the gases in the furnace as they traveled through the furnace due to convection.

These radiant superheaters were different from those in that they were installed in such positions that they were exposed directly to the radiant heat from the combustion of the fuel. The advantage of the radiant superheaters over the
convex type is that they not only give greater efficiency in 2853
boiler plant operation by utilizing more of the heat of combustion, but they also maintain constant temperature of steam over a wide range of loads. With convex superheaters, only, the tendency is for the temperatures to vary as the loads on the boiler vary, and the temperature of the gasses varies.

The installation of these radiant superheaters lowered the average heat consumption of the plant to 17,500 B. t. u.

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per kilowatt hour during the first half of 1924, and after the

new boilers had been in operation for some time, the consumption dropped to 16,000 B. t. u. per kilowatt hour.

The downward trend which had been established prior to the installation of these radiant superheaters was continued after they went into operation, but this contribution to the economy of the plant shows up by an abrupt drop in the economy curve in the months following their installation and beginning of operation.

In 1926, the additional units, which I stated were in-
2855 stalled at that time, were accompanied by the installation of a third boiler room. The boilers installed at this time were designed to operate so as to deliver steam to the turbines at a pressure of 1,230 pounds.

This was the first installation of its size in the world to operate at that pressure. One turbo-generator rated at 7,700 kilowatts, 1,230 pounds pressure, and 290 pounds exhaust, was installed as a topping turbine to a 30,000 kilowatt unit which was also installed at the same time.

The high pressure generator, or rather the high pressure turbine, receives the steam at 1,230 pounds, expands it
2856 to 290 pounds when it is returned to the boiler for reheating. It is reheated to 700 degrees and is then delivered to the second generator which, at that time, was one of the 30,000 kilowatt units.

The successful operation of this high-pressure boiler and the topping turbine was a third major contribution to the field of power generation that was made by the Lakeside Plant.

As would be expected, difficulties were encountered in the operation of the 1,200-pound equipment and the efficiency

of the plant wasn't improved very greatly until these difficulties had been remedied.

By 1928, the equipment was operating smoothly and one more high-pressure boiler and two generating units were installed as before. The units operated in tandem as was the case with the first two high-pressure units.

The high efficiency of these units lowered the plant heat consumption to below 15,000 B. t. u. per kilowatt hour in 1929.

Two more high-pressure boilers and three more units, 2858
operating on the high-pressure-low-pressure cycle, were installed in 1930, bringing the total installed capacity of the plant to its present figure of 310,800 kilowatts.

As we know, at about that time, the business depression occurred and, as a result of that, the demand on the power plant fell off considerably. Because of the reduced loads on the plant, it was possible to produce most of its output by means of the high-pressure equipment.

This type of operation resulted in the maximum efficiency that could be achieved at the plant and in the winter of 1932

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and 1933, the heat consumption of the Lakeside Plant reached its all-time minimum average of about 13,000 B. t. u. per kilowatt hour of net output.

In addition to the contributions which Lakeside Plant has made to the field of power generation in the development of the use of pulverized coal, the use of radiant superheaters and large scale employment of high-pressure steam cycles, a series of experiments in low-temperature distillation of coal was also conducted there.

These experiments were carried on for the purpose of ascertaining whether it would be possible to submit pulverized coal to temperatures at which the gas could be distilled off the coal without affecting the physical properties of the coal to such an extent that it could not subsequently be used in pulverized fuel boilers.

These experiments were carried on over a period of several months and the conclusions reached were that by means of the processes and equipment developed through those ex-
2861 periments, such low temperature distillation can be carried on successfully and can be carried on economically if a market for the by-products of the process could be had.

The Lakeside Plant was subsequently equipped to carry on that type of distillation of coal and the Port Washington Plant, which I will subsequently describe, has also been equipped to distill coal by that process.

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We are not in the gas business, however, and we have not carried on those operations, but the management felt that inasmuch as that process could be conducted at the plants
2862 and it had possibilities of economy, that it would be wise to equip the plants in order to permit carrying it out.

The cost of equipment was very low and has not in any way interfered with the efficient operation of the plants as power generating stations.

Now, there is one noteworthy fact that should be brought out in a discussion of the Lakeside Power Plant and that is that in spite of the pioneering developments that were carried out in the construction of that plant, it was still constructed at a remarkably low unit cost.

The investment in the entire plant, including the step-up sub-station through which its output is delivered to the transmission and distribution facilities of Wisconsin Electric Power Company, is only $83.68 per kilowatt of installed capacity.

Q. Will you describe the Port Washington Generating Station? A. The Port Washington Generating Station is located in the city of Port Washington about twenty-five miles north of Milwaukee. It is on the shore of Lake Michigan. 2864

The plant contains one power generating unit, a turbo-generator rated at 80,000 kilowatts. This unit operates at a throttle pressure of 1,230 pounds per square inch and a

steam temperature of 825 degrees.

The boiler burns pulverized coal exclusively and the entire plant went into service in November in 1935.

The Lakeside Plant was originally planned to have an ultimate capacity of 200,000 kilowatts, but during its process of construction, loads on the system of the companies had grown so rapidly that the plant was carried beyond its orig- 2865
inally contemplated capacity to its present capacity of 310,800 on completion.

Even then it was evident that it wouldn't be long before the company would be faced with the problem of providing additional generating facilities and studies were made to determine the best location and type of such facilities. As I pointed out before, Lakeside is located south of the city of Milwaukee and was located there because loads had grown substantially in that direction during the years prior to its construction.

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At the time studies were being made to determine where the plant now located at Port Washington should be built, consideration was given to the fact that it would be desirable to have another plant located at some distance from the Lakeside Plant in such position so that the two would be fairly well balanced against the load center of the district they serve.

The site finally selected was in the city of Port Wash-
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2867 ington and the reasons for the selection were:

First, the site north of Milwaukee, permitting the construction of a transmission loop, guaranteeing continuity of service to the area lying between the two major generating stations of the company.

It is located as near the load center of the system as was practical to do so inasmuch as it is twenty-three miles north of the Granville Sub-Station which is the major distribution center of the system, and Lakeside is twenty-four miles south of the Granville Sub-Station.

This location gives a very desirable balance of power
2868 facilities and load location.

The plant is located on Lake Michigan, which again is a very valuable source of cooling water. Port Washington has harbor facilities which permits the plant to receive lake-borne shipments of coal. It is in close proximity to existing transmission lines connecting Milwaukee and the properties of Wisconsin Michigan Power Company to the north.

Port Washington is a location to which large industries might be attracted by the presence of a source of economical power and, finally, the site chosen had convenient rail con-

nections to the transportation facilities operated by the company.

Q. At that last point, isn't Lakeside similarly connected by rail facilities? A. Yes, Lakeside is. Lakeside is connected

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to the railway system of the Transport Company by a rail line over which all the coal burned in the plant is hauled.

The Examiner: Does your company pulverize this coal or does it buy it in pulverized form?

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The Witness: No, it pulverizes its coal in the plants.

The coal—taking Port Washington as an example—is received on lake coal boats. It is unloaded on a coal dock which was built at the time the plant was constructed, and is stored there.

It is drawn from that storage and loaded onto rail cars which dump it into a screening plant, which screens out the heavy lumps and crushes them.

From the screening plant it is carried into the power plant where it is discharged into the pulver- 2871
izing mills. The design of the Lakeside Plant was made by engineers in the power plant department of Wisconsin Electric Power Company.

By Mr. Hamilton:

Q. You are speaking of Lakeside now or Port Washington? A. I am sorry. I mean Port Washington.

After the plans were completed, construction was begun in 1930. At that time, loads had recently been increasing and it was anticipated that the 80,000 kilowatts of capacity

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2872 to be installed in the plant would be needed within the length of time it would take to complete the construction of the plant.

The depression again disturbed those plans and load demands on the system fell off. As a result of that, construction was not carried on as rapidly as the original program contemplated, but was carried on at a rate sufficient to discharge the obligations of the company with respect to various commitments it had made on the purchase of equipment.

2873 Because of the delayed construction, the plant wasn't completed until 1935 and it went into operation in November of that year, adding 80,000 kilowatts to the active generating capacity of Wisconsin Electric Power Company.

The knowledge and experience gained by the company's engineers in the construction and operation of the Lakeside Plant were fully utilized in the design and construction of the Port Washington Plant.

The unit at Port Washington is what is called a tandem compound unit, in that it has a turbine with a high-pressure end and a low-pressure end. The boiler delivers steam to
2874 the high-pressure section of the turbine at 1,230 pounds pressure and a temperature of 825 degrees Fahrenheit.

The high-pressure section expands the steam through its stages and exhausts at pressures which vary, depending on the load on the unit, up to the neighborhood of 455 pounds

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per square inch.

The steam is then carried back to the boiler and is passed through superheaters which reheat it to a temperature of 825 degrees and it is then returned to the low-pressure section of the turbine.

In passing through that section, it is fully expanded and exhausted into a condenser which is cooled by water pumped from Lake Michigan.

The plans for the station contemplate an ultimate capacity of 400,000 kilowatts and, as at present conceived, that ultimate capacity will comprise five units of 80,000 kilowatts each.

The present construction provides certain facilities in excess of those required for the operation of the present
capacity. The coal dock, for instance, has a storage capacity 2876
of 330,000 tons of coal.

That storage will be adequate for considerably greater capacity than is now installed in the plant. The switch house and the coal handling facilities and the water tunnel which now supplies cooling water to the condenser, have all been installed to a greater capacity than is utilized by the present generating unit.

The present total investment in the plant, including the step-up sub-station, amounts to $105.72 per kilowatt of in-

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stalled capacity, and if we apportion to future capacity those 2877
parts of the present facilities which have been installed for the use of additional capacity in the plant, there remains an investment of $79.59 per kilowatt of present installed capacity.

The Examiner: We will recess until 2:00 o'clock this afternoon.

(Whereupon, at 12:30 o'clock p. m., the hearing was recessed until 2:00 o'clock.)

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Afternoon Session

(Whereupon, at 2:00 o'clock p. m., September 10, 1940, the hearing reconvened.)

The Examiner: You may proceed when you are ready.

Whereupon, Edward H. Schmidtman, the witness on the stand at the time of recess, resumed the stand, was
2879 examined and testified further as follows:

Direct Examination by Mr. Hamilton (Continued):

Q. Had you finished your description, Mr. Schmidtman, of the Port Washington Generating Station? A. Not entirely. I wanted to point out that the plant embodies a number of features which are worthy of note. One is that it is built entirely on the unit plan of construction—that is, the first section was laid out, being a single unit, naturally was built on the unit construction basis, but the plans for the ultimate plant will carry that same type of design throughout the
2880 entire station.

Each generating unit will be served by one boiler plant. It will have its own set of auxiliaries, its own transformers, and its own transmission circuits.

The plant will permit of flexibility in the design of future sections, being constructed on the unit basis. If any new developments in the art of using the steam cycles in generat-

ing electric power should take place, those developments can be incorporated in subsequent additions to the plant without disturbing the operation of those put in prior to that time.

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The high temperature of the steam is somewhat above that employed in the Lakeside Plant and is in the range of the highest pressures used in steam plants today, both at the throttle and at the reheat temperature. That high temperature gives greater economy in the utilization of the heat.

The fourth point is that the energy is generated at 22,000 volts which results in reduced current carrying capacity of station wiring, switchboards and bus structures.

The Port Washington Power Plant has established an economy record which has not been equalled by any other 2882
plant in the world in regular central station operation.

Problems have arisen in connection with the operation of the equipment and some interruptions have occurred resulting in shut-downs of the plant. Such instances would be expected in the operation of any new power plant or any old one for that matter.

In spite of these shut-downs, however, most of which were scheduled for inspection or repair work, the station has achieved the following average heat ecenomy record:

In 1936, the heat consumption averaged 10,954 B. t. u. 2883
per kilowatt hour of net output.

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In 1937, it averaged 10,835 B. t. u. per kilowatt hour of net output.

In 1938, it averaged 10,788 B. t. u. per kilowatt hour.

In 1939, the average was 10,770 B. t. u. per kilowatt hour.

And, in the first six months of 1940, the average heat consumption per kilowatt hour of net output was 10,730 B. t. u.

The minimum monthly average heat consumption was 10,562 B. t. u. per kilowatt hour of net output and was realized in October of 1938.

Q. These plants which you have described are plants in regular operation, are they not? A. Yes, they are.

Q. And, as you have indicated in the case of the Racine Plant, the boilers are operated with regularity even though demand may not be placed upon them all the time? A. Yes, that is the case.

2885 Q. Are there any other stations in the system which are not operated with regularity? A. There are other plants in the system which are used entirely for steam heating purposes and are used for those purposes only occasionally. One of these is the plant located in the Public Service Building referred to as the Public Service Building Plant.

The Public Service Building is the main office building

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of Wisconsin Electric Power Company and is located in the business district in the downtown area of the city.

This plant was originally built in 1906 when the building
2886 was constructed and it had an electric generating capacity at that time of 4,500 kilowatts.

The electrical generating equipment was taken out of service in 1925, but the boilers have been continued in operation for the purpose of furnishing steam for the heating system.

The boiler plant is not operated regularly but is held as reserve steam generating capacity. Because of its location with respect to the steam distribution mains, the Public Service Building boiler plant renders valuable service to the

heating system in relieving some of the mains of heavy loads in that part of the area served so that it assists in maintaining continuity of service in that part of the system as well as relieving the other steam generating plants of a portion of their load during the peak heating system.

Q. Is there, in addition, a plant located in Stephenson Building? A. Yes. Wisconsin Electric Power Company also operates a boiler plant in the Stephenson Building. The company does not own the building but leases the space
that is occupied by the boiler plant. 2888

This plant was acquired in 1926 when the company pur-

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chased the utility property of Wells Power Company, a small company operating electric generating and distribution facilities in the city.

The generating capacity of the plant at that time was 1,000 kilowatts. The Wisconsin Electric Power Company has never made use of that generating equipment and shortly after acquisition removed it from service, keeping the boilers in use for steam generating purposes.

This boiler plant is operated regularly in the summer 2889
time only and supplements the steam transmission capacity of the high-pressure mains which serve buildings with heat for heating water and other heating requirements during the summer time other than space heating.

The low-pressure steam heating system is shut down completely in the summer and the high-pressure system is continued in operation purely for heating water and steam tables, and so forth, and the Stephenson Building Plant is used to supplement the transmission capacity of the mains

which furnish that service in the part of the city where this plant is located.

Q. Are the plants in the Stephenson Building and Public Service Building designated on Exhibit No. 32? A. No, they are not designated on Exhibit 32 as power plants inasmuch as they have no electric generating capacity.

Q. The Racine Plant, however, is designated? A. Yes,

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the Racine Plant is designated on the map. It is shown by
2891 the open square with the vertical bar located at the city of Racine.

Q. What generating capacity does Wisconsin Gas & Electric Company have? A. Wisconsin Gas & Electric Company has four electric generating stations, having a combined installed generating capacity of 1,590 kilowatts. These facilities are very limited in capacity and are composed of 590 kilowatts of hydro-electric capacity and 1,000 kilowatts of steam generator capacity.

The hydro-electric capacity is made up of three stations. One is located at Watertown on the Rock River and has an
2892 installed capacity of 240 kilowatts.

The other two are located in and near the city of West Bend. They are on the Milwaukee River and have an installed capacity of 175 kilowatts each. These plants are all low-head plants—that is, the height through which the water falls in generating power in their water turbines is relatively low.

They are on small streams which have extremely variable flows and their output is small and not dependable. These

hydro-electric plants are operated only when there is sufficient water in the streams to make their operation possible.

The steam power plant of Wisconsin Gas & Electric Com-

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pany is located in the city of Waukesha. It was acquired by Wisconsin Gas & Electric Company in 1923 by the purchase of the electric and gas properties of the Waukesha Gas & Electric Company.

The installed generator capacity is 1,000 kilowatts, but 2894
the generating equipment is not operated at all. The boilers are in continuous operation during the heating season and furnish steam for a heating system in Waukesha.

The electrical equipment is held as cold reserve on the system of Wisconsin Gas & Electric Company and is available as reserve capacity for the combined systems of the three companies.

These three generating stations of Wisconsin Gas & Electric Company produce a very minor part of the total power requirements of the company.

As I have stated before, the output is not firm and is not 2895
relied upon. In 1939, it constituted only six-tenths of one per cent. of the total electrical energy requirements of Wisconsin Gas & Electric Company. The other 99.4 per cent. was purchased from Wisconsin Electric Power Company.

Q. The steam generating plant at Waukesha is designated on the map, is it not, Exhibit 32? A. Yes, it is shown on Exhibit 32, with a symbol designating a steam power plant.

Q. For the reason that it is available as reserve power

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although not in operation, is that right? A. That is right.

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Q. When you stated that the company did not rely for firm power or treat as firm power, power generated from its own facilities, you were speaking of both the hydro-electric plants and the steam plants, is that right? A. I was speaking specifically of the hydro-electric plants when I stated that the capacity was not firm and was not dependable. The steam plant, as I have stated, generates no power regularly and is held as reserve capacity.

Q. What is the aggregate generating capacity of Wis-
2897 consin Michigan Power Company? A. Wisconsin Michigan Power Company owns and operates twelve generating stations having an aggregate installed capacity of 57,990 kilowatts.

Of these twelve generating stations, ten are hydro-electric plants with an installed capacity of 36,280 kilowatts in total. One of the twelve plants is a steam station located at Appleton, having an installed capacity of 20,000 kilowatts and one is a Diesel engine generating station located at Iron River, having a capacity of 1,710 kilowatts.

Q. Turning, first, to the hydro-electric plants, is there a
2898 hydro-electric plant at Appleton, Wisconsin? A. Yes, there is.

Q. Will you describe it? A. Exhibit 32 shows a symbol

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at Appleton designating a combined steam and hydro-electric power plant. The hydro-electric portion of this plant has an installed capacity of 1,440 kilowatts and the generating equipment consists of two vertical units rated at 520 kilowatts each, and one horizontal unit rated at 400 kilowatts.

Q. You might explain, if you will, the difference between a vertical and a horizontal unit. A. The terms "vertical" and "horizontal" as applied to hydro-electric generating units, refers to the position of the shaft in the machine. A vertical unit has a vertical shaft, usually with the generator at the top and the water turbine at the bottom.

The generator is mounted on the generator floor and the turbine is included in a casing or wheel pit below the generator floor. The water comes into the plant through the
gates in the side of the building immediately adjacent to the 2900
water turbines, and flows through the turbines then downward and out of the plant in what is referred to as the "tail race."

The horizontal unit in the Appleton plant is one with a horizontal shaft with the water turbines mounted on one end outside the building and the generator on the other end inside the building.

The Appleton hydro-electric plant is located on the Fox River in the city of Appleton. It has an average operating

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head of fifteen feet which is furnished by the upper of three 2901
navigation dams maintained in Appleton by the United States Government.

Q. And an operating head is what? A. The operating head is the distance in feet, the vertical distance in feet, between the elevation of the water above the dam from which the plant takes its water and the elevation of the open water surface immediately below the plant into which the water turbine discharges the water that passes through it.

As I explained yesterday, the water power existing at the navigation dams on the Fox River belongs to the Green

Bay & Mississippi Canal Company. The land on which the Appleton power plant stands is leased from the Green Bay & Mississippi Canal Company, and Wisconsin Michigan Power Company pays to the Canal Company a rental for the use of the land as well as annual tolls for the use of the power in the falling water at that point.

The water at the upper dam in Appleton is divided among several users according to the terms of the leases which the Green Bay & Mississippi Canal Company has executed with
2903 water users located at that point.

Under the terms of those leases, a certain portion of the flow in the Fox River above navigation requirements is available for use by Wisconsin Michigan Power Company, not all

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of it but only a specified portion of it.

As I recall, there are four or five different concerns which make use of water from the so-called upper level which is the level of water created by the upper dam in Appleton. Because of the limited amount of water available to the company for its use in this plant, the Appleton hydro-electric
2904 plant, naturally, is operated so as to make the most complete use possible of that available water.

The flow in the Fox River, although regulated to some extent by the operation of the government storage dam at Neenah and Menasha, is still widely fluctuating as to quantity of discharge at different times of the year.

It also varies widely as to average discharge from year to year. There are instances on record where the flow in the river was so low that there was no water at all available above requirements for navigation.

Under those circumstances, the water power plants utilizing the surplus water in the river at the navigation dams had to shut down.

The Appleton hydro-electric plant has been shut down for days at a time because of inadequacy of water in the river. This plant was built in 1901 and was the successor to the world's first hydro-electric station.

The original plant began operating on September 30, 1882, which was only a few days after Thomas Edison's Pearl Street Station in New York went into operation. 2906

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This pioneer hydro-electric plant generated electricity for lighting purposes only and its customers consisted of two paper mills and one residence. The generator in this plant was referred to as a dynamo and it received its power from the shaft of a beating machine in the paper mill.

The load on the beater was so variable, due to the manufacturing operations, that the dynamo would speed up and slow down as the speed of the machine varied. As a result, the voltage fluctuated widely and numerous lamp burn-outs resulted. Lamps were very expensive in those days. 2907

One of the present employees of Wisconsin Michigan Power Company recalls quite clearly that he would make the rounds every morning with a basket full of lamps and he would get $1.60 a piece for them.

Well, a situation under which lamps burned out so rapidly was intolerable, so very shortly the unit was taken off that beater shaft and was connected to be driven by a separate water wheel.

The original installation of the present Appleton power plant was made in 1901 by Wisconsin Traction, Light, Heat

& Power Company, which I have explained was a predecessor of Wisconsin Michigan Power Company.

The plant contained four 500 k. v. a. generators, two of which generated direct current at 600 volts for the railway

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system, and the other two of which generated alternating current for distribution.

These generators were mounted in pairs on two horizontal shafts, one direct current unit and one alternating
2909 current unit on each shaft.

The shafts projected through the outer walls of the power plant building into wheel flumes, which were built for the purpose of conveying the water from above the dam to the water turbines.

Each of these shafts carried three pairs of water turbines. In 1916 one of these entire units was removed and one generator from the other unit was removed. The space that had been occupied by the one unit which was removed completely was then utilized by the installation of two vertical hydro-electric units which are now in place—the two
2910 that are rated at 520 kilowatts each.

The reduced efficiency of the original wheels on the remaining horizontal unit made it impossible for that unit to carry full load on both the generators attached to the shaft so it has been re-rated at 400 kilowatts, giving the present rated capacity of 1,440 kilowatts in the Appleton hydro-electric plant.

Q. Is there a steam plant at Appleton as well? A. Yes, there is. The steam plant at Appleton is housed in the same building that houses the Appleton hydro-electric plant.

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The capacity of the steam station is 20,000 kilowatts, consisting of four turbo-generators rated at 5,000 kilowatts each. The boilers which furnish the steam for these units burn pulverized coal exclusively and deliver steam to the turbines at a pressure of 265 pounds per square inch and a temperature of 480 degrees.

The Appleton steam plant is operated very largely as a source of stand-by or auxiliary power for the ten hydro-electric stations operated by Wisconsin Michigan Power Company. Because of the importance of the loads in the 2912
Appleton area and the surrounding territory, it is considered advisable to keep at least one unit in the Appleton steam plant spinning at all times and carrying a light load.

The reason for that is that during certain times of the year when the output from the hydro-electric plants is high, most of the load in the Appleton area is carried by means of power delivered to the Appleton district over the high voltage transmission line from the northern portion of the territory.

In case of an outage on that line, it would be most im-
portant for the company to have spinning reserve at Apple- 2913
ton to immediately pick up that load without interruption to service.

The original installation at the Appleton steam plant was made in 1901 at the same time the hydro-electric plant

was built.

The two plants were built together. The initial generating equipment consisted of two 1,500 horsepower Corliss engines with clutches by means of which those engines could

be connected to the shafts on which the original horizontal hydro-electric units operated.

There were also clutches between the water turbines on those shafts and the generators. That arrangement made it possible to drive the generators by means of water power from the river or by means of steam power from the engine, or with both together.

In case there was not enough water to carry the load alone, that power would be supplemented by operating the
2915 steam engines.

By 1910, the loads on the plant had increased to the point where it was necessary to make an enlargement in its generating capacity and two low-pressure turbines driving generators rated at 1,250 kilowatts each, were installed in that year.

Two of the present 5,000 kilowatt units were added in 1917. Another was added in 1920, and another in 1924. In the year 1925, the boiler plant was converted to the use of pulverized coal, the success of that method of firing having been demonstrated at the Lakeside Plant in Milwaukee.

2916 In 1926, the first year of operation with pulverized coal,

—1,377—

the average heat consumption per kilowatt hour of net output was reduced by more than 25 per cent. of the average for 1924, the last year of operation before the adoption of pulverized fuel.

In order to relieve a crowded condition in the plant and to facilitate the rearrangement of certain electrical equipment, the two Corliss engines and the low-pressure turbines were removed in 1931. That reduced the installed capacity in the plant to the present figure of 20,000 kilowatts.

The Appleton steam plant was built by Wisconsin Traction, Light, Heat & Power Company. That company was merged into Peninsular Power Company which operated properties in upper Wisconsin and upper Michigan, and in 1927, the name of Peninsular Power Company was changed to Wisconsin Michigan Power Company.

Q. Is there a hydro-electric station in Twin Falls? A. Yes, there is.

Q. Will you describe it? A. The hydro-electric station
located at Twin Falls is indicated on Exhibit 32 by the open 2918
square with the horizontal bar located north and slightly west of Iron Mountain, Michigan. It is at the junction of those five transmission lines which are shown on the map.

Q. Before we leave that, there is no name, is there, which

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appears to identify it? A. No. The name of the plant is not shown on the map.

Q. Can you identify it with relation to any name which is shown on the map? A. Yes. It is on the Menominee
River northeast of the City of Iron Mountain. 2919

Q. Don't you mean northwest? A. Yes. I mean northwest.

Q. Northeast of Florence? A. Northwest of Iron Mountain is a better description.

Q. And northeast of Florence? A. East and slightly south of Florence.

Q. Oh, yes. A. The power plant building is located on the Michigan shore of the river and the dam reaches from Wisconsin across the river to Michigan.

The generation of the plant, however, is classified as generation in the state of Michigan.

The original section of this plant which was built in 1912 consisted of three units rated at 1,000 kilowatts each. In 1916, the plant was enlarged by the addition of two more units likewise rated at 1,000 kilowatts.

These are horizontal units, the wheels being contained in wheel casings inside the power plant building rather than in a wheel flume. The average operating head on the Twin

2921 —1,379—

Falls plant is forty-two feet.

The Menominee River, at this point, drains a watershed of 1,790 square miles which contributes the water available for the use of the plant. The area of the pond above the dam—that is, the water surface of the lake formed by the dam, itself—is 1,120 acres.

This pond is large enough to permit some degree of manipulation of stored water. By that I mean that it is possible for the plant to operate in such a way as to use more water than is flowing in the river at a given time or less water

2922 than is flowing in the river at another time by taking the additional water from the pond above the dam or permitting it to accumulate in the pond above the dam.

The extent to which Twin Falls plant can be operated in this manner is limited, however, by the fact that the plant is located on a stream which also serves a number of other water power plants below, and out of respect for their riparian rights, it is necessary for the Twin Falls plant to deliver substantially the natural flow of the stream to those water users downstream.

The volume of the pond above the dam is such that by drawing it down one foot, the plant is capable of generating 35,000 kilowatt hours of energy. The pond at Twin Falls is utilized to a considerable extent in ironing out the irregularities of flow resulting from peak load operations at the

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Brule River plant located upstream which I will describe next.

The Twin Falls plant is also operated in such a way that its discharge will offset the irregular discharge from the 2924
Pine River plant located on the Pine River, whose operations I will also describe shortly.

Q. What is the present capacity of the Twin Falls plant? A. The present capacity is 5,000 kilowatts. That rating is at a rated power factor of 80 per cent.

The 80 per cent. power factor is the power factor specified by the manufacturer of the machines, but because of the characteristics of the transmission line through which a large part of the output from the Twin Falls plant is delivered, the plant usually operates at a power factor approximating unity, and because of that fact, it is possible for the plant 2925
to carry 6,200 kilowatts without overloading the units, and that load is frequently carried at the plant during seasons of plenty of water.

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Q. Will you describe the Brule River plant? A. The Brule River hydro-electric plant is located on the Brule River northwest of the Twin Falls plant and northeast of the community of Florence. The plant is situated on an island in the Brule River but the island is considered a part of Michigan

so this plant is likewise located on the Michigan side of the river and its generation is classified as Michigan generation.

I should have explained in discussing the Twin Falls plant that it was built by Peninsular Power Company, predecessor to Wisconsin Michigan Power Company. At the time the Twin Falls plant was built Peninsular Power Company was operating an electric transmission and distribution system in the vicinity of Iron Mountain and Iron River. The principal sources of power at that time were the Twin
2927 Falls plant and a steam plant at the city of Iron River.

Loads increased during the years following 1912 and it was necessary to install additional generating facilities, and for that reason the Brule plant was built by Peninsular Power Company in 1916. The plant has a total installed generator capacity of 4,670 kilowatts, comprising three vertical turbine-driven generators.

The operating head on the plant is 60 feet when the pond is at normal elevation and the drainage area of the Brule River at this point is 1,040 square miles. The pond, when full, has a surface area of 774 acres and for each foot
2928 of elevation by which the pond is drawn down the plant is

—1,382—

able to generate 36,000 kilowatt hours of net output.

The pondage capacity of the Brule plant is used in carrying peak loads in the upper Michigan and northern Wisconsin portions of the territory of the Wisconsin Michigan Power Company. During the peak hours of the day the full capacity of the plant is operated, almost regardless of the season of the year.

This type of operation results during seasons of low flow in the discharge of larger quantities of water at certain times

of day and smaller quantities of water at other times of day. The irregular flow that is caused by this operation is discharged into the pond of the Twin Falls plant which is located immediately downstream.

There are no water users between and the operation as carried on does no damage with respect to conservation and so that type of operation is permissible, inasmuch as the Twin Falls plant is used as a regulating reservoir to smooth out the irregular flows.

The circumstances which make it possible for the Brule 2930
plant to be operated in this manner add appreciably to the value of the Brule River plant as a source of power in this portion of the company's system. If it were not for those characteristics there would be times of the year when the output of the plant would be limited to that which it could generate by using the reduced flow in the Brule River, whereas actually the plant can carry rated load at almost

—1,383—

any season of the year during the peak hours of the day.

Q. You have referred to the Pine River plant. Will you describe it? A. The Pine River plant is located on the Pine 2931
River which is shown on Exhibit 32 about five or ten miles west of the Menominee River. It is southwest from Iron Mountain and south from Florence. This plant was built in 1922 by Peninsular Power Company in order to increase its power supply. It operates at a head of 93 feet which is the highest head of any of the hydro-electric plants operated by Wisconsin Michigan Power Company.

Q. In order to clarify its location, did I understand you to say that it was southwest of Iron Mountain? A. I mis-

stated myself there. I was referring to Twin Falls. It is southwest of Twin Falls and south of Florence, nearly due west from Iron Mountain.

The drainage area of the Pine River at the point where the Pine River plant is located, is 520 square miles. The plant contains two vertical generating units, each rated at 1,600 kw, giving a total installed capacity of 3,200 kw. The pond above the dam at the Pine River plant is quite small, covering an area of only 170 acres when it is full.

2933 This plant was developed by building a relatively low dam across the Pine River at the head of Breakwater Rapids, then building a canal and flume along the side of the valley through which the river flows to a point on the hillside above

—1,384—

the location of the plant. At that point there is a large concrete forebay from which two steel penstocks extend down the side of the bank to the plant which is located on the shore of the Pine River at the foot of the rapids.

By means of the dam and the canal and flume the head, or rather the fall in the river, through the course of the
2934 rapids, is concentrated at the one point and amounts to a total of slightly over 93 feet. Allowing for friction losses in conveying the water the plant has an operating head of 93 feet.

Although the pond above the Pine River dam is rather small, the higher head on the plant makes it possible for the water to be used quite effectively in carrying peak loads. Perhaps I should explain. The amount of power that can be generated from falling water varies in direct proportion to the pressure or head which that water exerts on the blades

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of the turbine it is turning, and also in direct proportion to the quantity of water which is flowing through the turbine.

Now then in this case we have a head more than twice as great as we have at Twin Falls so each cubic foot of water that is discharged by the Pine River plant will do more than twice as much work and will produce more than twice as much electrical energy at the Pine River plant as it would at the Twin Falls plant.

So in spite of the smaller reservoir or pond the higher

—1,385— 2936

head makes it possible for the Pine River plant to be operated quite effectively as a carrier of daily peak loads. The pond is not large enough to store water over an operating cycle of more than one day, but it is quite effective for carrying hourly variations within the daily load curve.

The high head effective here gives the pond a peak load capacity of 11,000 k. w. h. for each foot of draw-down on the pond. The irregularities in flow in the Pine River which result from the peak load operations at the Pine River plant are carried on down and discharged into the Menominee River a short distance below the Twin Falls plant, as indi- 2937
cated by the map, Exhibit 32.

Immediately downstream from the mouth of the Pine River is a hydro-electric plant operated by the Ford Motor Company.

In order to deliver natural stream flow to the plant of the Ford Motor Company while the Pine River plant is being operated to carry peaks the Twin Falls plant is operated so that its discharge will offset the fluctuations in discharge from Pine River. That can be done effectively be-

cause in off-setting the flow it is necessary to supply only one cubic foot of water at Twin Falls for each cubic foot of water held back at Pine or to hold back one cubic foot of water at Twin Falls for each one delivered at Pine.

At the same time the cubic foot of water that is used at the Pine River plant produces twice as much power as the one withheld at Twin Falls would have produced, so the combined operation of the Twin Falls, the Brule and the

—1,386—

2939 Pine River plants work out as a very effective carrier of peak loads.

Q. Will you describe the Quinnesec Falls plant? A. The Quinnesec Falls plant of Wisconsin Michigan Power Company is located on the Menominee River south of the city of Iron Mountain. The symbol indicating this plant is shown on the map. This plant has an installed capacity of 3,530 kw, made up of two identical horizontal units.

The average head on the Quinnesec Falls plant is 61 feet and the drainage area of the Menominee River at that point is 2,600 square miles. The dam at this point is quite low,
2940 most of the head being furnished by the elevation of the falls, themselves.

The reservoir is small because of the low dam and does not contain enough water to permit any appreciable degree of peak load operation by the plant. For this reason the plant is run on what we refer to as a river-run basis using the flow in the stream as it comes up to the capacity of the plant to use such flow.

This plant was built by the Oliver Iron Mining Company in 1914. The mining company used the output of the plant

in operating its equipment in its iron mines near Iron Mountain and near Norway, Michigan.

The mining operations in Iron Mountain have subsequently been reduced and the mining company decided to sell the plant to Wisconsin Michigan Power Company. That

—1,387—

purchase was made in 1934. The Quinnesec Falls plant was originally built to operate at a head of 56 feet and did operate at that head during the period of its ownership by the
mining company. 2942

At the same location and utilizing water from the same dam the Oliver Iron Mining Company operated a water-driven air compressor plant in which they compressed air for use in their mining operations. The water was supplied to the air compressor plant through an open flume, the upper edge of which was at such elevation that the head on both plants was 56 feet. When Wisconsin Michigan Power Company purchased the plant from the mining company it did not desire to continue operation of the air compressor plant so the gates to the flume were blocked off and the spill-
ways on the dam, itself, were raised five feet, resulting in 2943
an increase in head of five feet on the hydro-electric plant. Because of that change the head is now 61 feet and the electric generating capacity and the electric output of that station are considerably higher than they were under the original arrangement.

I stated that the installed capacity of the plant had a rating of 3,530 kw. That rating is computed on the basis of a 80 per cent. power factor. The units were designed to operate at an 85 per cent. power factor, but the fact is that

2944 they are normally operated under Wisconsin Michigan Power Company operations at almost unity power factor. This

—1,388—

gives them a capacity of about 4,400 kw and by overloading them within safe limits during the periods of the year when the flow in the river is sufficient to carry such loads, the company has been able to operate the plant fairly continuously, at loads approximating 4,600 kw.

This site is what would be referred to as under-developed.
2945 By that expression I mean that in terms of the head and the available water at the site under normal stream flow conditions a plant would ordinarily be expected to have a higher installed capacity than this one has. The low installed capacity in this plant results from the fact that when the Oliver Iron Mining Company built it they were then using a substantial portion of the flow in the river for operating that air compressor and there was no object in installing more hydro-electric equipment than could be operated along with the air compressing machinery. Because of that the hydro-electric plant is unable to use as much of the flow of the river
2946 as most plants on the system of the company are able to use, and if a development were made at this point today, assuming that present plant were not in place, the installed capacity would be considerably above that now in the plant.

Q. How much, would you say? A. It would be at least twice as great.

Q. Is the Menominee River the state line at the point on

—1,389—

the map at which Quinnesec Falls is shown? A. Yes, it is. The Menominee River constitutes the boundary between the

states of Wisconsin and Michigan, all the way from the mouth at Green Bay——

Q. Now, a symbol appears on the map on the south side, that is to say on the Wisconsin side, of the river; the plant is actually—— A. The plant is actually located on the Michigan shore of the river, yes. It was put on the south side there not to indicate the geographical location but rather to indicate a schematic relationship to the system.

Before continuing with the other plants perhaps it would be pertinent at this point to make some general observations 2948
about what is required for a hydro-electric development. There is a fairly popular misconception on this point which leads people to believe that a hydro-electric power plant can be built at almost any point that one would care to build one. That isn't the case. A number of very specific requirements must be met before it is economical to build a hydro-electric plant. First, a suitable location must be found and by a suitable location I mean one where the topography, that is the shape of the ground, is such that a dam can be built at not too great expense.

There should be a fairly steep pitch in the stream or there 2949
should be a fairly narrow canyon or gorge that won't take too large a dam to back up the water.

—1,390—

Second, the characteristics of the stream should be such that there will be a sufficient quantity of water available with sufficient regularity to permit a plant installed at that point to deliver some degree of dependable output.

The drainage area above the point in question is important, in that it will have a large influence on the percentage

of total precipitation which will run off and be discharged by the stream. Its magnitude or size will determine the volume of flow available.

The characteristics of the stream with respect to variations in flow should be reasonably satisfactory in that the plant won't have to be shut off entirely for periods in the year because there is no water in the river and neither should it go so high during flood season that the tailwater rises to a point where the head is reduced and the capacity of the
2951 plant is curtailed.

In the general area in which the hydro-electric plants of Wisconsin Michigan Power Company are located the streams have reasonably steady flows. The Menominee River and its tributaries are not considered extremely flashy. The sites located in this general district, however, will all fall into the low head class, that is we have nothing that will approximate the heads available in some of the larger and better known plants in the country. For that reason one who develops water power sites in this district must be sure that the flow of water is sufficiently dependable, the cost of the

2952 —1,391—

installation is sufficiently low, that the output from the plant will be reasonably steady before he can afford to make investment in a development of that kind. We find it necessary to furnish steam stand-by capacity equal to about one-half of the installed capacity of a hydro-electric plant in order to make the output of that plant firm. In the case of some streams the steam stand-by must be higher than that because the stream falls so low that output of the plant falls to less than one-half of the installed capacity.

Q. Are there recognizable periods of high and low flow in the rivers on which you have plants in the Wisconsin Michigan territory? A. Yes, there are.

Q. They occur with regularity, year after year? A. Yes, within small variation we know fairly well when the spring flood is going to come and when the summer drought will occur. We also have a very regular secondary flood in the fall preceding the winter freeze-up.

Q. Will you identify the periods of high and low flow by
months? A. The high water season in our streams usually 2954
begins between March 15 and April 1, and tapers off to what we would consider medium flow conditions by the middle of June. In the later part of July and carrying all through August and into September we experience our summer drought. In October and the early part of November we

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normally have a rainy season on the watershed of these streams which carries the flow well above drought conditions and approaches mild flood conditions. The flow then falls off and stays relatively low during the winter but not as
low as it is during the summer drought. We experience our 2955
lowest run-off conditions in the summertime.

Now, from year to year these variations may shift a week or two in either direction, but within those limits they can be depended upon to occur at those times except in years of unusually severe drought when the fall rains may not develop at all and the summer drought may be of longer duration than is the case normally.

Q. And in your load forecasting you actually do depend, do you not, on the occurrence of those periods of high and low water? A. Yes, we do.

Q. Within those limits? A. Yes, we do. We budget our production according to a schedule which recognizes those variations in flow and the manner in which they affect the hydro-electric out-put.

Q. Will you describe the Sturgeon River hydro-electric plant? A. The Sturgeon River power plant of the Wisconsin Michigan Power Company is located on the Sturgeon River near the community of Loretto, a few miles east of the city of Norway, in Michigan.

2957 —1,393—

The Sturgeon River is a tributary of the Menominee River. This plant has a single unit rated at 800 kw capacity. It operates at an average head of 65 feet and the river at that point drains an area of about 300 square miles. The plant was built in 1922 by Peninsular Power Company as an additional source of energy for distribution on its system.

The pond above the dam, when full, has a surface area of 248 acres and the plant, by drawing on this stored water, can generate 12,000 kw hours for each foot of draw-down within the draw-down range.

2958 Each of these plants has a limit to which the pond water can be drawn down economically because when the elevation of the pond water is lowered the head or pressure on the wheels is reduced and a given quantity of water used under those conditions of reduced head will produce fewer k. w. h. than it would produce if the pond level were at its maximum.

The flow in the Sturgeon River is not sufficient to permit the plant to carry full load at all times but by utilizing the water stored in the pond it is possible to make the full installed capacity of the plant available for peak load operation during the peak load hours of the day.

There are no other users of water power on the Sturgeon
River below this plant and except for conservation requirements, that is with respect to not injuring fish life, the plant
is capable of exercising some latitude in manipulating the
flow of the stream.

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All of these peaking operations of the hydro-electric
plants of the Wisconsin Michigan Power Company must be
carried on within the limitations imposed by consideration
of conservation matters. The Conservation Commission of 2960
Wisconsin has authority over regulation of stream flow to the
extent that it may affect aquatic life and so no operator of
a power plant is permitted to shut off the flow of a stream
completely because if that were done there would be considerable damage to the fish.

The statute also requires that fish ladders or fish ways
must be provided wherever a dam is built across a stream
in the state ~~and if such~~ fish ways or fish ladders are not provided the owner or operator of the dam has the option of
entering into an agreement with the Conservation Commission under which the operator will either stock the waters 2961
with fish above the dam or will pay to have such stocking
done.

Mr. Binford: Was that the Wisconsin Commission?

The Witness: The Wisconsin Conservation Commission.

The Examiner: Are you through with that answer?

The Witness: Yes, with that point I am through.

The Examiner: We will have a little recess then.

(Whereupon, a short recess was taken.)

—1,395—

By Mr. Hamilton:

Q. Will you describe the Chalk Hill Plant, Mr. Schmidtman? A. The Chalk Hill hydro-electric plant is situated on the Michigan side of the Menominee River, ten miles east of Amberg, Wisconsin. Amberg is not shown by name on Exhibit 32 but is located at the junction of the 132,000 volt line in Marinette County, Wisconsin.

The total installed generating capacity of the Chalk Hill Plant is 7,800 kilowatts.

2963 Q. I think you had better locate that plant a little more specifically. Can you locate it in relation to Niagara? A. Did you say with relation to Niagara? It is downstream from Niagara on the Menominee River just outside the area indicated as the electric service territory of Wisconsin Michigan Power Company.

It is the upper one of those two hydro-electric plants in that vicinity. The Chalk Hill plant has three vertical generating units rated at 2,600 kilowatts each. It operates at an average head of twenty-eight feet and receives its water from the drainage area of 3,300 square miles.

2964 The surface area of the pond above the dam is 765 acres and the pond contains sufficient water to permit the generation of 15,000 kilowatt hours for each foot of pond drawdown.

The Chalk Hill Plant is ordinarily operated as a river-

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run plant, utilizing the flow of the stream as it comes, but when peak carrying capacity beyond that supplied by the other plants is needed in the northern portion of the territory, this plant is also operated as a peak carrier.

The irregular discharge of water resulting from these peaking operations is absorbed in the pond of the White Rapids Plant which is located immediately downstream.

The Chalk Hill Plant was constructed in 1927 and was acquired in 1937 by Wisconsin Michigan Power Company. The former owner was Northern Paper Mills, a concern which operated a paper mill in Green Bay.

Q. And it was acquired in what year? A. It was acquired in 1937 by Wisconsin Michigan Power Company.

Q. Will you describe the White Rapids hydro-electric plant? A. The White Rapids hydro-electric plant is located on the Michigan shore of the Menominee River immediately downstream from the Chalk Hill Plant. The generating equipment in this plant comprises three vertical units, two rated at 3,000 kilowatts each and one rated at 2,000 kilowatts, making a total rated generator capacity of 8,000 kilowatts. 2966

The drainage area of the river at this point is 3,400 square miles and the head—the operating head on the plant is twenty-nine feet.

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The pond above the White Rapids dam is somewhat smaller than that above the Chalk Hill dam, covering an area of 445 acres when the pond is at maximum operating elevation. Sufficient water is stored in the pond to generate 10,000 kilowatt hours per foot of pond draw-down.

This plant is operated so as to discharge normal flow to the stream below. The pond is utilized to absorb the irregularities in the discharge of the Chalk Hill Plant when that plant is used in helping to carry peak loads on the company's system.

The White Rapids plant was built in 1927 at the same time that the Chalk Hill Plant was built. The two stations were connected by means of a 132,000 volt transmission line with the paper mill of the Northern Paper Mills at Green Bay.

They were also connected by means of another 132,000 volt transmission circuit to the 132,000 volt transmission line of Wisconsin Michigan Power Company lying between Twin Falls and Appleton.

2969 The Northern Paper Mills used such power as it needed in its operations of the paper mill of Green Bay and sold the surplus output from the two plants to Wisconsin Michigan Power Company.

The contract for the sale of this energy provided that the entire output of the Chalk Hill Plant should be delivered

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to the company and the surplus output of the White Rapids Plant, over and above the paper mills requirements in its operations—excuse me. Would you read that please?

2970 (Whereupon the statement above was read by the reporter.)

A. (Continuing) ——should also be delivered to the company.

This arrangement was continued until 1937 when Wisconsin Michigan Power Company purchased both plants from Northern Paper Mills.

Q. Both Chalk Hill and White Rapids? A. Yes.

Q. Now, is there a hydro-electric plant at Oconto Falls? A. Yes, there is.

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Q. Will you describe it? A. The Oconto Falls hydro-electric plant is located on the Oconto River at the community of Oconto Falls. It is shown on the map, Exhibit 32, at a point outside the territory designated as the electric service territory of Wisconsin Michigan Power Company, in Oconto County.

Q. Wisconsin? A. Wisconsin Michigan Power Company.

Q. Oconto County, Wisconsin? A. Yes. This plant has a combined installed capacity of 1,440 kilowatts consisting of four horizontal units of various sizes. 2972

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The drainage area of the Oconto River at this point is 754 square miles and the head on the hydro-electric plant averages twenty-eight feet under operating conditions.

The pond above the dam is limited in size, having a surface area of only 240 acres at maximum elevation.

The plant is capable of generating five thousand kilowatt hours from stored water for each foot the pond is drawn down. The Oconto Falls Plant is used in carrying daily peaks during the low water season to as great an extent as the capacity of the pond will permit. 2973

This peaking capacity is of great value to Wisconsin Michigan Power Company because the plant is located at the end of the transmission system in the southern portion of the company's territory and is very effective in maintaining voltage regulation on the system in that district.

The plant also relieves peak loads on the transmission circuits serving the territory at that point.

The Oconto Falls Plant was built in 1915, the first section consisting of one unit with a capacity of 600 kilowatts. It

was rebuilt in 1924 and since that time has been used to generate electrical energy for a pulp mill at Oconto Falls and for distribution to the public.

This plant was purchased by Wisconsin Michigan Power Company from the Union Falls Manufacturing Company, the

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former owners.

Q. Have you named all the hydro-electric plants of Wisconsin Michigan Power Company? A. No, there is one more
2975 known as the Weyauwega—W-e-y-a-u-w-e-g-a—located at the community of Weyauwega in the southwestern portion of the territory near Appleton. It is designated by the symbol indicating a hydro-electric plant and is shown in the southern portion of Waupaca County, Wisconsin.

This plant contains a single generating unit rated at 400 kilowatts.

The unit is of the vertical type and operates at an average head of evelen feet. The reservoir area—or rather the pond area—above the dam, covers 286 acres and contains enough water to generate 2,400 kilowatt hours for each foot
2976 of draw-down.

During seasons when the flow in the stream is sufficient to drive the plant at full load, the plant operates so as to utilize as much water as possible.

During seasons when the flow is below plant capacity, the unit is operated so as to carry daily peaks to the extent that the limited reservoir capacity will permit.

The Weyauwega Plant was acquired by Wisconsin Michigan Power Company in 1925 when the property of the Weyauwega Electric Company was purchased. The plant

which was included with the property acquired at that time

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was an old and obsolete and inefficient installation.

The plant was completely rebuilt by Wisconsin Michigan Power Company in 1930 when the present equipment was installed.

Q. You spoke of one Diesel engine plant as being owned by Wisconsin Michigan Power Company. Will you locate that plant? A. The only Diesel engine plant owned by Wis-
consin Michigan Power Company is located in the city of 2978
Iron River, Michigan.

This plant is shown by the appropriate symbol on Exhibit 32 at the city of Iron River, west of Crystal Falls. It contains two generating units, each rated at 855 kilowatts, giving a total rated capacity of 1,710 kilowatts.

The generators are driven by 1,250 horsepower, five-cylinder Diesel engines.

The plant was built by Peninsula Power Company in 1923 as a means of increasing its supply of stand-by power to make firm the generation of the water power plants
operated by that company at that time. 2979

The plant is not now in regular operation, but is started and run under load for short periods periodically in order to make sure that the equipment is in operating condition and could be used in case the occasion required.

Q. Has the company a storage reservoir under construc-

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tion in the Michigamme River? A. Yes, Wisconsin Michigan Power Company is now engaged in the construction of a storage dam on the Michigamme River in Iron County,

Michigan—M-i-c-h-i-g-a-m-m-e. The location of this dam is not shown on Exhibit 32, but can be located on the map as the point at which the Michigamme River makes a sharp turn north and east of Crystal Falls. The dam will be located on the east and west section of the river at that point.

Q. The river runs almost directly east in Dickinson County, does it not? A. At the point where the reservoir dam will be constructed, the river extends for a very short distance into the open area of the map northeast of Crystal Falls and
2981 the dam will be constructed on a section of the stream where it is actually flowing toward the west.

This dam will result in a substantial improvement in the regularity of the flow in the Menominee River and will consequently improve the characteristics of the power generated by all plants on the Menominee.

The reservoir is of such capacity that it will store five billion cubic feet of water and will increase the firm capacity of the four hydro-electric plants of Wisconsin Michigan Power Company on the Menominee River by about 3,700 kilowatts and will increase their annual output by about seven
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and a half million kilowatt hours.

Q. Can you approximate the time at which this proposed dam will be completed? A. The present construction schedule which is being followed successfully contemplates that the dam will be finished in time to capture the spring floods in the year 1941. That means that it will have to be finished no later than the first of March, 1941.

The present progress of the construction indicates that that completion date will easily be met.

Q. In addition to the existing hydro-electric plants, what additional water power sites does Wisconsin Michigan Power Company own? A. Wisconsin Michigan Power Company owns part or all of the land required for the development of six water power sites. One of these is located on a stream which is not shown on Exhibit 32. It is the Sturgeon River which flows north into Lake Superior from Baraga County which is shown on the map.

The river rises in the vicinity of Michigamme which ap-
pears on the map above the letter "G" in the word Michigan, 2984
and flows generally to the west, turns around to the north-
east and discharges into the body of water which cuts off
the Keweenaw Peninsula from the main body of the upper
peninsula.

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The undeveloped power site is located in Baraga County
at about the west limit of the open space to the west of the
word Baraga. This site has an available head of eighty-
seven feet and if developed to utilize the quantities of flow
usually utilized in rivers of this character, will support a
generating capacity of 1,350 kilowatts and in a normal 2985
stream flow year would produce an output of 2,500 kilo-
watt hours.

Q. And that location has a name, does it? A. Yes, that site is known as the Big Falls site on the upper Sturgeon River. The word "upper" is applied to this Sturgeon River to distinguish it from the Sturgeon River in Dickinson County on which the Sturgeon River Plant of Wisconsin Michigan Power Company is now located.

Another of these undeveloped water power sites is located on the Paint River which flows into the pond of the Brule River Plant.

The Paint River is a relatively small stream and has not been shown on the map, Exhibit 32. This site known as Horse Race Rapids has a potential head of sixty feet and will support an installation of 2,400 kilowatts which in a year of normal run-off would be capable of generating 13,-200,000 kilowatt hours.

2987 Q. Would you relate that site to a town in the relatively immediate neighborhood? A. The best way of describing the location of that site would be to say that it is

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located north of and in the immediate vicinity of the Brule River Plant which is northeast of Florence.

Another of the undeveloped sites in which Wisconsin Michigan Power Company is interested is known as the La-Salle Rapids site on the Pine River.

This site is located upstream from the Pine River Plant just below the junction of the two rivers that join at that
2988 point.

The available head here is forty-nine feet and the site would support a capacity of 2,000 kilowatts which would produce 7,000,000 kilowatt hours in a year of normal stream flow.

Q. And the junction of the two rivers to which you referred appears on the map, Exhibit 32? A. Yes, the junction does appear on the map.

Another undeveloped water power site owned by Wisconsin Michigan Power Company exists in the form of addi-

tional head which could be developed at the company's present Quinnesec Falls Plant.

I explained that this plant was purchased from Oliver Iron Mining Company. When that purchase was made, there was also acquired from the Mining Company sufficient land above the pond of the present plant to permit the development of additional head of twenty-nine feet, either by means of raising the present dam at Quinnesec Falls to that

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extent or by installing another dam upstream at a point 2990
where that head could be developed.

The more economical plan of utilizing this increased head would be to raise the dam at Quinnesec Falls. If that were done, an additional head of twenty-nine feet would be utilized, permitting the economical installation of an additional capacity of 10,000 kilowatts which would generate increased output of 64,000,000 kilowatt hours in a year of normal run-off.

All of the additional capacity covered by this redevelopment and the additional output available from it would not
be due to the increased head of twenty-nine feet. 2991

A portion of it would be due to increasing the use of water at the site beyond the point to which the present capacity is able to use the water.

I explained that the present plant is under-developed. The proposed redevelopment which I have just outlined would not be an under-development of the site.

Q. Is the figure of 10,000 kilowatts which you have given additional to the existing capacity of Quinnesec Falls? A. Yes, that would be additional capacity.

Q. So that the redevelopment would not disturb the existing capacity of Quinnesec Falls? A. No, not at all, and the 64,000,000 kilowatt hours would be in addition to the

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output of the present plant. Another undeveloped water power site in which Wisconsin Michigan Power Company holds a portion of the land required for development is known as Sand Portage Rapids on the Menominee River.

This site is located at a point on the Menominee River
2993 which falls between the communities of Niagara and Norway on Exhibit 32.

The head available at Sand Portage Rapids is forty-two feet. The proposed development would have a capacity of 9,100 kilowatts and would generate an average annual output of 38,000,000 kilowatt hours.

Another undeveloped hydro-electric site owned by Wisconsin Michigan Power Company is known as the Pemene—P-e-m-e-n-e—dam site on the Menominee River.

This site is located at a point upstream from the Chalk Hill Plant where on Exhibit 32 the Menominee River first
2994 has electric service territory of Wisconsin Michigan Power Company on both sides.

The available head at the Pemene dam site is twenty-seven feet and a development of that head would support a capacity of 6,000 kilowatts and produce an annual average output of 30,000,000 kilowatt hours.

There are three other undeveloped water power sites in the territory ~~of Wisc~~onsin Michigan Power Company whose value would be materially improved by the construction of

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the Michigamme storage reservoir.

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Extensive investigation of these sites has not been made, but it is known that after the Michigamme reservoir is completed, these three sites which are located on the Michigamme River between the site of the reservoir dam and the mouth of the stream, where it flows into the Menominee River below the Brule River Plant, would support a total installed capacity of about 15,000 kilowatts.

I would like to add here also that all of the undeveloped power sites which I have named and have described as being located on the Menominee River will also be improved con- 2996
siderably in value by the completion of the Michigamme storage reservoir, because of the improvement in flow that that reservoir will produce on the Menominee River.

Q. Does that mean then that the figures you have given for the three named sites on the Menominee River would be increased as a result of the operation of the Michigamme reservoir now in construction? A. It is possible, depending on load conditions existing on the system at the time of the development of these sites, that the improved flow resulting from the operation of the Michigamme reservoir would lead
to a decision to install more capacity at some of these points 2997
than I have indicated normal stream flow would economically support.

It can't be stated with certainty whether that would happen, but it is entirely possible because of the improved flow that would be present in the stream.

This much is true, however, that whether the capacity of these proposed plants is changed or not, the operation of the Michigamme storage reservoir will undoubtedly increase the

2998 *Edward H. Schmidtman—By Respondents—Direct*

number of kilowatt hours available annually from the operation of such plants and to that extent would enhance their value.

All of these undeveloped sites are reasonably attractive. That is, they are not just places on the river where it looks as if power could be generated.

They will all reasonably well support the investment that would be required in making the installations, provided there is a market for the power.

2999 Under present conditions, Wisconsin Michigan Power Company is meeting its power requirements adequately with its present generation facilities and by means of an interconnection with the system of Wisconsin Electric Power Company.

Q. Have these sites been chosen as a result of extensive studies? A. Yes, they have. Each of these sites that I have named has been surveyed, preliminary cost estimates involving preliminary designs have been carried out, estimates of the available output and the value of such output have been

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3000 made in order to determine whether the sites are worthy of consideration.

In each case, it has been found that with a market for the power the sites are worth more than the cost of the land which the company has purchased at the various locations.

I emphasize a need for a market for the power because that consideration is making it more and more difficult for water powers anywhere in the country to be developed economically.

I testified this morning on the progress that has been made in economy of generation by steam. Those advances

in economy and improvements in efficiency have been accompanied by reductions in cost.

Everyone of these water power sites will be critically examined as to whether it will be capable of competing with the low-cost steam power which can be produced in the steam plants of Wisconsin Electric Power Company before money will be spent on improving them.

Should the loads in the northern portion of Wisconsin
Michigan Power Company's territory develop, however, as
we hope it will, it is quite likely that many of these cites 3002
will be found economical and will be actually developed.

Q. You speke of some of the factors which enter into the selection of a water power site. Did you make rainfall

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studies in connection with such a selection? A. Yes. We have made extensive studies prior to the acquisition of any of these undeveloped sites.

In the cases of some, the investigations have been more
extensive than in the cases of the others. The Big Falls
site on the Sturgeon River, which is the first one I men-
tioned, was one on which the most extensive studies of all 3003
were made.

At the time Wisconsin Michigan Power Company became interested in the acquisition of that property, there wasn't a great deal of reliable information available on the discharge characteristics of the Sturgeon River.

Some studies had been made a number of years before, but there were gaps in their record and those gaps occurred during the flood seasons of the year, which, for the purposes of this investigation, were the most critical periods of the year.

This development, as studied at that time, contemplated a very large storage reservoir which could be filled only by means of capturing the extreme floods in the spring. The reason that those gaps existed in the data made available to us was that the stream gauging stations that had been installed by the engineers who made the previous investigation had been put at such places that they were incapable of measuring the stages in the river during those periods.

A second reason was that the curves which those engineers

3005 —1,412—

had prepared, by means of which the elevation of the water in a river is related to the discharge of the river, had been determined at points which the floods, themselves, disturbed and changed the relationship of the water stage—meaning the elevation of the water—to the stream discharge.

Now, because of those gaps in the data, we were not satisfied to use the assumed figures which had been supplied because, upon investigation, we found that those estimated figures which had been offered in substitute for actual records indicated flows substantially in excess of what the flows
3006 would have been estimated at had we used actual records on surrounding streams for those same periods.

The Sturgeon River drains into Lake Superior and drains an area lying generally in the northern part of Iron County, most of Baraga County and reaching over into Ontonagon and Gogebic Counties.

Other streams draining portions of that same general area showed characteristics which led us to believe that the estimated figures for the Sturgeon River were considerably exaggerated.

Now, this property was being offered to the company for sale and although we had no reason to question the integrity of the people who had made the studies, our job was to find out whether the representations that they were making with respect to this site could be relied upon.

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As a result of the discrepancy between the estimated figures supplied us and the performance of streams in surrounding watersheds, we decided that the best thing to do would be to install our own stream-flow gauges and our own pre- 3008
cipitation gauges on the watershed drained by the Sturgeon River.

Those gauging points and rainfall stations were installed and were kept in operation for a number of years. The records I believe have not been taken during the past two years, but were continued even beyond the time when we were convinced that the price of the property was less than its value as a potential power site.

The company did purchase that property and now holds the Big Falls site as a potential source of water power which 3009
would be very useful, as may be seen from the map, in holding up the voltage on the portion of the system reaching into that district and in relieving the transmission line of the loads it must carry in serving that district.

Power capacity on the outlying branches of a system has more value than simply that assignable to so many kilowatts or so many kilowatt hours.

It has what an economist would call "place utility" by being located on a part of the system at which it can do more

than just supply kilowatt hours to a customer and can also improve general operations of the transmission system.

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We have made similar investigations on other undeveloped sites although they weren't quite as searching as those we made on the Sturgeon River.

Q. Generally speaking, is production expense low on the hydro-electric plants? A. Yes, it is. Production expense per kilowatt hour of output is very low in hydro-electric
3011 plants, very much below production expense in steam plants. The principal element of cost connected with hydro-electric generation is that of fixed charges on the investment.

Here again, however, two of the elements of fixed charges are sometimes lower than in the case of steam plants. One of those is depreciation.

The rotating equipment in a hydro-electric plant almost invariably operates at a lower speed than does the equipment in a steam plant. It has a longer life and the investment in dams and reservoirs and waterways has a very long life, and over all, the depreciation on investment in hydro-electric
3012 developments is substantially less than that on investment in steam power plants.

The other element of fixed charges which is sometimes lower in the case of water power developments is that of taxes, especially in districts where utility properties are taxed locally.

These plants are in outlying areas. They are in the

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woods, one might say, and certain times of the year some of these plants can be reached only by skis or snowshoes and the tax rates in the townships in which these plants are

located would be expected to run below the taxes of locally taxed property in the metropolitan areas.

It happens that in the case of utilities operating in the State of Wisconsin, the operating properties are taxed by the State, so the location has little influence on the tax rates, but in some instances it is entirely possible for the tax rate on hydro-electric properties to be appreciably below that on steam properties which are usually located at the urban centers where their load is situated.

Q. How about labor costs? A. The labor cost per kilowatt hour in hydro-electric plants is also below that in steam plants. 3014

Depending upon the type of load the plants carry, a hydro-electric station might produce more kilowatt hours per kilowatt of capacity than a steam plant or less than a steam plant. One couldn't generalize on that, but the amount of labor required per kilowatt of generating capacity is much less in a hydro-electric plant and generally the labor cost per kilowatt hour is less.

The reason for that can be seen if we consider one element—that of maintenance. Maintenance costs on hydro-electric properties are very low in comparison with maintenance costs on steam operating properties, as I pointed 3015

out with respect to depreciation.

Those same differences would apply to maintenance costs, particularly with respect to rotating equipment.

Q. But it is necessary in this territory to back up the hydro-electric production with steam power? A. Oh, yes. It is most necessary because of the character of the streams on which our hydro-electric plants are located.

I have pointed out that the streams utilized for hydro-electric generation by Wisconsin Michigan Power Company are relatively steady. Perhaps, I should be a little more specific on that point. They are steady with respect to many other streams in our part of the country, but the degree to which they are steady might best be illustrated by the statement that the flow in he Menominee River sometimes falls to a point where the Twin Falls Plant can carry a load equal to only about one-fifth of its installed generating capacity.

3017 At other times of the year, during the floods, the discharge of the Menominee River at the Twin Falls Plant is as much as eight to ten times the capacity of the plant. During those seasons all of the water in excess of the capacity of the wheels to utilize it naturally has to be spilled through the spillways.

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There are no plants on the system of Wisconsin Michigan Power Company which do not find it necessary at certain times of the year to spill considerable quantities of water.

3018 Mr. Hamilton: We are about to turn, Mr. Examiner, to another general subject matter of the presentation.

Perhaps this is a time to break off for the evening.

The Examiner: All right, we will recess until tomorrow morning at 10:00 o'clock.

(Whereupon, at 4:25 o'clock p. m., the hearing was recessed until 10:00 o'clock a. m., September 11, 1940.)

—1,418—

BEFORE THE 3019

Securities and Exchange Commission

File No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.* 3020

Hearing Room 1102,
Securities and Exchange Commission Building,
Washington, D. C.,
Wednesday, September 11, 1940.

Met, pursuant to adjournment, at 10:00 o'clock a. m.

Before: W. W. SWIFT, *Trial Examiner.* 3021

Appearances:

CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, Attorney for the Securities and Exchange Commission.

3022 *Edward H. Schmidtman—By Respondents—Direct*

PROCEEDINGS

The Examiner: Let us resume, gentlemen.

Edward H. Schmidtman resumed the stand and testified further as follows:

Direct Examination by Mr. Hamilton (Continued):

Q. Mr. Schmidtman, how many points of interconnection are there between Wisconsin Electric Power Company and
3023 Wisconsin Gas & Electric Company in the transmission system of the two companies? A. There are seventeen points of interconnection between the electric systems of Wisconsin Electric Power Company and Wisconsin Gas & Electric Company which are shown on Exhibit 32.

These points of interconnection appear at Racine, at a point north of Racine on the territorial boundary line between the area served by Wisconsin Electric Power Company and the territory served by Wisconsin Gas & Electric Company; at Kenosha, at Burlington, at two points between Burlington and Racine at Waukesha, at Whitewater in the
3024 northwest corner of Walworth County, at Watertown, at the village of Merton, which is in the northern part of Waukesha County where the color of the line changes from yellow to red; at Granville Sub-station, at the point where the line of Wisconsin Gas & Electric Company enters the territory of Wisconsin Electric Power Company, west of Whitefish Bay,

at Port Washington, at a railway sub-station a few miles northeast of Port Washington, at Belgium, at Cedar Grove, and at Elkhart Lake which is in the northern portion of the territory served by Wisconsin Gas & Electric Company.

In addition to these seventeen points of interconnection which are shown on the map, there are twenty-two other points at which the systems of the two companies interconnect, which points are not shown on this map because the lines haven't been shown.

For the most part, those lines are distribution lines operating at voltages below those of the lines shown on the map.

Q. Can you indicate generally those twenty-two points of interconnection? A. It will be difficult to explain the 3026
locations of some of them because they are on low voltage distribution lines and are at points which are not connected with any of the points indicated on the map.

An example of that would be two points of interconnection near the city of Racine in the distribution systems of the two companies.

There is one connection in the township of Granville which is the township in which the Granville Sub-Station is located. There is another in the township of Waukesha where

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the city of Waukesha is located, another near the village of 3027
Pewaukee, which appears north of Waukesha.

There is one in the township of Sullivan in Jefferson County, another in the township of Eagle in Jefferson County. There is another north of Milwaukee in the vicinity of River Hills which appears on the map, another at the sub-station at Brown Deer, another in the township of Merton, in which the village of Merton is located, one in the township of Brookfield, where the village of Brookfield is situated. That village may be found on the map nearly due west from the village of Shorewood which is on the shore

of the lake, a distance of about two inches on the map; in the township of Troy in which the village of Troy Center in the northern portion of Walworth County is located there is another such interconnection.

There is another in the township of Oconomowoc near the city of Oconomowoc in the northwest portion of Waukesha County.

Now, I haven't named them all, but those will serve as examples.

3029 Q. Altogether there are twenty-two? A. Yes, altogether there are twenty-two which are on lines not shown on the map.

These twenty-two points of interconnection are used to deliver energy from the system of one company to the system of the other and the amounts of energy so transferred at these points is less than the amounts transferred at the

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points shown on the map because of the fact that the lines are at lower voltages and are portions of the distribution system rather than being parts of the main transmission
3030 systems of the companies.

Q. Now, is there an interconnection between the electric service properties of the Wisconsin Electric Power Company and those of Wisconsin Michigan Power Company? A. Yes, there is. There is a high capacity interconnection between the transmission systems of Wisconsin Electric Power Company and Wisconsin Michigan Power Company at the Appleton sub-station.

That interconnection is shown by the interconnection symbol which appears to the right of the sub-station symbol at the city of Appleton.

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The transmission line colored red, extending from the Milwaukee area to this interconnection point is owned by Wisconsin Electric Power Company.

At that point, the interconnection is through the city limits sub-station of Wisconsin Michigan Power Company with the transmission facilities of that company.

Q And the city limit sub-station is located on the city limits of Appleton, Wisconsin? A. Yes, that is right.

Q. Now, there appears on Exhibit No. 32, I believe, a

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parallel line. a parallel transmission line, for at least a part of the distance between Appleton and the eastern portion of the Wisconsin Michigan property at that point.

Is it correct to say that the lines of the two systems are operated in parallel at that stretch of territory? A. Speaking electrically, those two lines do not operate in parallel; they operate in series.

Q. But they parallel each other physically? A. They parallel each other physically, and the two circuits are carried on opposite sides of one string of double-circuit steel towers. 3033

Q. That is what I am trying to get at. A. Yes.

Q. And from that point, the line goes generally north as the property of Wisconsin Michigan Power Company up to the northern territory, is that true? A: Yes, that is true.

Q. And would you mind identifying that line so there will be no possible confusion between county lines? A. The line of the Wisconsin Michigan Power Company extending from the city limit sub-station goes to the east and dips slightly to the south to a point where it departs from the

line of Wisconsin Electric Power Company, coming in from Milwaukee.

That junction is located near the community of Forest

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Junction, the name of which is not indicated on Exhibit 32.

From that point, the line of Wisconsin Michigan Power Company extends in a northeasterly direction to the vicinity of Green Bay, then skirts the southwestern tip of Green Bay and extends generally north past the community of Niagara,
3035 and then into Michigan and northwest to the high voltage sub-station at the Twin Falls hydro-electric plant.

At that point the 132,000 volt line of Wisconsin Michigan Power Company terminates.

Q. And the voltage of the line that you have just located is 132,000 from Appleton for its entire course, is that right? A. Yes, it is. I will describe that line in more complete detail later.

Q. What is the circuit mileage of the transmission system operated by Wisconsin Electric Power Company? A. Wisconsin Electric Power Company operates 675 miles of
3036 transmission circuits which are carried on 534 miles of supports. The reason that there are more miles of circuit than there are of supports is that some of the supports carry more than one circuit.

Of the 675 miles of circuits, 301 miles operate at 132,000 volts, and 374 miles operate at 26,400 volts.

The mileage of lines operating at 26,400 volts at the present time includes forty-two miles of line originally built

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to operate at 66,000 volts, but which is being temporarily operated at 26,400 volts at the present time.

Within the next year or so that line will again be operated at 66,000 volts. Wisconsin Electric Power Company is making some extensions of its transmission capacity and this temporary operation of the line at 26,400 volts and its future conversion back to 66,000 volts are a part of the general program.

I would like to point out that the interconnections, which Wisconsin Electric Power Company has with the systems of Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company, have the effect of uniting the combined 3038
facilities of all three companies into one effective operating power system.

The flow of energy as between the systems of the three companies is carried out to the mutual advantage of all three, the idea being kept in mind that the most advantageous method of operating the three with respect to over-all results, is the proper one to follow.

Returning now to the mileage of transmission lines operated by Wisconsin Electric Power Company, 253 miles of the 534 miles of supports are steel towers, three miles are made up of underground conduit, and 278 miles are made up 3039
of pole line.

This length of pole line includes seven and a half miles

of wood pole "H" frames, which are used to support a 132,000 volt circuit. All the other mileage of pole lines consists of single poles.

Q. Now, there appears on Respondents' Exhibit No. 32, a transmission line between Milwaukee and Watertown. Will you describe that line? A. The line to which you refer begins at the West Allis Sub-station in the city of West Allis.

That sub-station is indicated on Exhibit 32 by the sub-station symbol immediately below the community indicated as West Allis at the west limits of Milwaukee.

The line extends west to Waukesha, then northwest to Waukesha Beach, continuing west through the community of Delafield, then west and north past the city of Oconomowoc, then north and west through the community of Ixonia and west and northwest to the city of Watertown.

This line is the line of forty-two mile length which I spoke
3041 of a moment ago as being operated temporarily at 26,400 volts although originally constructed for 66,000 volt operation.

It consists of two circuits of 1/0 copper which are carried on double circuit steel towers. Each of these circuits consists of three conductors arranged in what is referred to as vertical arrangement; that is, the three wires are supported on one side of the towers with the suspension arranged so that

the wires are above each other in a vertical plane. There is one such circuit of three wires on each side of the towers.

3042 This line was originally built to operate at 66,000 volts and the first section of it which went into operation at that voltage extended from Waukesha Beach to Watertown. At Watertown it formed an interconnection with the system of Wisconsin Power & Light Company, a non-affiliated electric utility.

By means of that interconnection, there was purchased from Wisconsin Power & Light Company twenty-five-cycle hydro-electric energy generated in the Power and Light Company's hydro-electric plants on the Wisconsin River.

This section went into operation in 1909. The section from Waukesha Beach to West Allis at that time operated at 38,000 volts, but in 1914 it was reconstructed to operate at 66,000 volts.

For a number of years 25-cycle energy was received over this line from Wisconsin Power & Light Company, but Wisconsin Electric Power Company desired to eliminate the use of 25-cycle energy on its system and embarked on a program to reduce that use as rapidly as was reasonably possible to do so. 3044

As a result of that program, the market for 25-cycle energy on the system of Wisconsin Electric Power Company diminished and at the same time Wisconsin Power & Light Company embarked on a program of rewinding the gen-

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erators in those plants so that they would generate 60-cycle energy instead of 25-cycle.

That company also wished to reduce the use of 25-cycle energy on its system.

Now, as a result of the reduction of the generation of 25-cycle energy, one circuit of this transmission line from 3045
West Allis to Watertown was converted to 60-cycle operation at 26,400 volts in 1938 and in July of 1940, the delivery of 25-cycle energy to Wisconsin Electric Power Company ceased entirely and the other one of the two circuits was converted to 26,400 volt 60-cycle operation.

Q. Delivery by Wisconsin Power & Light Company? A. Yes. There is now under construction a 66,000 volt sub-station at a point to the west and slightly north of the present West Allis Sub-station. This new sub-station is

located on the 132,000 volt circuit which extends from the Lakeside Power Plant and carries on around to the north and connects with the line which extends to Appleton.

This sub-station will have an initial capacity of 15,000 k. v. a. and will have transformers that will transform between the voltages of 132,000 and 66,000. When the substation has been completed, it will relieve the West Allis Sub-station of its 66,000 volt operations and will then be the point of delivery to the line which extends to Watertown.

3047 —1,429—

At that time, the line to Watertown will again be converted to 66,000 volt operation.

The circuits of this line, since the termination of the delivery of 25-cycle energy by Wisconsin Power & Light Company, have served to carry energy from the metropolitan area to Watertown——

Q. (Interposing) The metropolitan area in Milwaukee? A. The Milwaukee metropolitan area, yes. (Continuing) ——to Watertown, and to the various distribution stations located along the route.

3048 It also serves to complete a transmission loop constituted by the circuits of Wisconsin Gas & Electric Company to Watertown and the circuits of this line from Watertown back to West Allis.

Q. So that energy is delivered into the system of the Wisconsin Gas & Electric Company at Watertown? A. Yes, it is by means of this line which I have just described.

Q. Now, will you describe the transmission line running from Milwaukee to Appleton? A. This line operates at 132,000 volts. We regard its one terminus as being at Lake-

 3049

side Power Plant and the other at the City Limits Substation of Wisconsin Michigan Power Company at Appleton.

The frequency is 60 cycles and the length of the line 119 miles.

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This line was built in three sections. The first section extended from the old Granville sub-station located near the site of the present Granville Sub-station, to Random Lake which appears on Exhibit 32 at a point directly west from Cedar Grove, which is near the shore of Lake Michigan. 3050

The purpose of that section of line which was built in 1923, was to deliver energy from the system of Wisconsin Electric Power Company to the system of Wisconsin Gas & Electric Company through a sub-station which was then in operation at Random Lake.

In the same year, later in the year, the line was extended as far north as Plymouth, which appears on Exhibit 32 as a community not served from the system of the companies. At that point there was formed an interconnection with the system of Wisconsin Power & Light Company which serves the territory not cross-hatched on the map in this general 3051
vicinity.

I should add here, however, that service from the city of Plymouth and the immediately surrounding territory is rendered by a municipal plant.

By means of the interconnection with the system of Wisconsin Power & Light Company at Plymouth, that company was able to obtain from Wisconsin Electric Power Company substantial quantities of electrical energy which were

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used in the Sheboygan district of the system of Wisconsin Power & Light Company.

In 1931, that interconnection was discontinued inasmuch as Wisconsin Power & Light Company completed in that year a 30,000 kilowatt steam generating station near the south limits of the city of Sheboygan.

That plant was able to take over the load which up to that time had been served by means of the interconnection with the system of Wisconsin Electric Power Company.

3053 The other two sections of the Lakeside-Appleton line were built in 1925. The section from Plymouth to Appleton consists of a single circuit 4/0 line of aluminum cable, steel reenforced.

That is the conductor which has a steel core with aluminum strands wound around it.

I neglected to state that the section of line from the old Granville Sub-station to Plymouth consisted of number 3/0, aluminum cable, steel reenforced.

The section of line from the old Granville Sub-station to the Lakeside Power Plant which was also built in 1925
3054 consisted of number 3/0 aluminum cable, steel reenforced, only one circuit being installed at that time on one side of double-circuit steel towers.

The section from Granville to Plymouth and the section

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from Plymouth to Appleton also consisted of a single circuit of conductors on double-circuit steel towers.

The construction of the latter two sections completed the connection between the Lakeside Power Plant of Wisconsin Electric Power Company and the Appleton sub-station of the Wisconsin Michigan Power Company.

This interconnection, as will be explained, subsequently, plays a very important part in the coordinated operation of the electric facilities of the two companies and further to the extent that Wisconsin Gas & Electric Company's operations are intimately interwoven with the electric operations of the Wisconsin Electric Power Company, this transmission line affects the operation of all three companies.

Q. Now, is that line in its entirety operated at 132,000 volts? A. Yes, it is. The entire length from the Lakeside Power Plant sub-station to the City Limit Sub-station at 3056
Appleton operates at 132,000 volts.

Q. And in its entirety is of steel tower construction? A. Yes, it is steel tower construction all the way.

Q. Available for double-circuits? A. There have subsequently been installed on a portion of the towers occupied by this circuit, other circuits which occupy the other side of the towers.

I will describe those in taking up those circuits indi-

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vidually.

We regard the line from the Lakeside Plant to the Apple- 3057
ton Sub-station as one individual circuit which is treated as a single unit in our transmission system.

That is why I have limited my description to that one circuit.

Q. Now, there appears on Respondents' Exhibit No. 32 a line running from the Lakeside Power Plant to Whitewater. Will you describe that line? A. This line also operates at 132,000 volts throughout its entire length. It has a total length of fifty miles and operates at 60 cycles. It

consists of one circuit of number 3/0 aluminum cable, steel reenforced, carried on double-circuit steel towers.

The other side of the towers carrying this circuit is vacant for the entire distance, the entire length of the line.

This line was built in 1925 in order to accommodate increased requirements for electric power on the system of Wisconsin Gas & Electric Company in the southwestern portion of the territory it serves.

Prior to the construction of the Lakeside-Whitewater
3059 line, these loads of Wisconsin Gas & Electric Company were carried by means of the 26,400 volts owned and operated by Wisconsin Gas & Electric Company which were supplied with energy at Kenosha, Burlington, and Watertown.

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These points of supply are points at which the system of Wisconsin Gas & Electric Company connects with that of Wisconsin Electric Power Company.

The capacity of the 26,400 volt lines serving the Whitewater area prior to 1925 was insufficient to adequately meet the requirements of the growing load and this 132,000 volt
3060 line was built to accommodate those loads.

In 1939, the line was extended approximately seven and a half miles to the southwest as shown on Exhibit 32.

At the point where this extension crosses the boundary line of the territory in which Wisconsin Gas & Electric Company renders electric service, it interconnects with a similar line of Wisconsin Power & Light Company extending northeast from the Janesville Sub-station of that company.

This extension consists of one circuit of aluminum cable, steel reenforced, with a cross-section of 266,800 circular mils.

The conductors are carried on wood pole "H" frames, this seven and a half mile length of "H" frame line being the section I referred to when I described the supports of the company's lines in general.

The contract covering the interconnection and interchange of power with Wisconsin Power & Light Company states that the facilities to be constructed by each of the companies shall be of sufficient capacity to furnish a source

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to either company of 25,000 kilowatts of emergency power. 3062

This line will carry a load of substantially more than 25,000 kilowatts.

If proper voltage regulation is available at the sending end and unity power factor could be maintained at the receiving end, the capacity of the entire length of line including the extension would be about 40,000 kilowatts.

The carrying capacity of that line could be increased from Lakeside to Whitewater by adding a second circuit on the vacant side of the double-circuit steel towers, but
from Whitewater to the point of interconnection with Wis- 3063
consin Power & Light Company the capacity could be increased only by either installing larger conductors, or by constructing another section of line because there is no available conductor space on the present supports.

Q. Now, the terminus of that line in Whitewater is what? A. The 132,000 volt sub-station of Wisconsin Gas & Electric Company located at Whitewater.

Q. And power is delivered into the system of Wisconsin Gas & Electric Company at that point? A. Yes, it is. The point of delivery at Whitewater is the 132,000 volt bus of the

sub-station. That bus, of course, belongs to Wisconsin Gas & Electric Company and the only outlet for that energy

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from that point is through the distribution system of Wisconsin Gas & Electric Company.

Now, energy interchanged with Wisconsin Power & Light Company at the territorial boundary line does not flow through the Whitewater sub-station of the Wisconsin Gas & Electric Company.

3065 It simply passes by and doesn't enter into the sub-station at all, but the energy delivered to the sub-station is taken off through the transmission and distribution lines of Wisconsin Gas & Electric Company.

Q. Have you indicated the voltage of the line running from Whitewater to the point of interconnection with Wisconsin Power & Light? A. Perhaps not specifically. That is a 132,000 volt line.

Q. Now, there appears on Respondents' Exhibit No. 32 a line connecting the Lakeside Power Plant with the city of Kenosha on the south. Will you describe that line? A. Yes.
3066 The line you refer to appears on Exhibit 32 as the one lying farthest to the left of the lines extending from the Lakeside Plant to the south. It does not pass through any of the communities shown along the lake shore. At a point west of Racine, a loop circuit takes off this line and extends into Racine and back to the main north-south route of the line.

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In Racine, it connects with the 19th Street 132,000 volt sub-station of Wisconsin Electric Power Company. Continuing south from a point west of Racine, it extends into

Kenosha where it connects with the 132,000 volt Albers Street Sub-station of the Wisconsin Gas & Electric Company.

Q. And here again, electric energy is delivered from the system of Wisconsin Electric Power Company into the system of Wisconsin Gas Company? A. Yes, energy is delivered by means of this line info the system of Wisconsin Gas & Electric Company at the Racine Sub-station of Wisconsin Electric Power Company, as well as at Kenosha Sub-station of Wisconsin Gas & Electric Company. 3068

This line operates at 132,000 volts and consists of a single circuit of number 4/0 copper conductor carried on double-circuit steel towers all the way from the Lakeside Plant to the Kenosha Sub-station.

Q. That is a distance of how many miles? A. A distance of sixty-one miles, including the loop into the Racine Sub-station.

Q. Sixty-one circuit miles? A. Yes.

Now, I stated that the line consisted of single-circuit conductors on double-circuit towers. That is true of the entire length of this line except that section extending into 3069

the Racine Sub-station.

On that section, the circuit goes in on one side of the towers and comes out on the other, so those towers are actually carrying two circuits of conductors.

The purpose of constructing this line was to increase the supply of power for the Racine and Kenosha districts. Prior to the construction, the loads in those areas were served by means of 26,400 volt lines lying generally along

the lake shore and by means of power generated in the Racine Power Plant.

The line was built in 1925. In 1927, this line was extended from Kenosha, a distance of about two miles west, and then straight south to the Illinois line where it interconnected with the system of the Public Service Company of northern Illinois.

By reference to Exhibit 32, it will be observed that there is a short section of line of Wisconsin Electric Power Com-
3071 pany extending west from the city of Kenosha. This short section represents the portion of the section which was extended to the Illinois line which now all remains completely in place.

The purpose of the Illinois interconnection was to furnish a source of emergency power for both Wisconsin Electric Power Company and the Public Service Company of northern Illinois.

—1,439—

The interconnection facilities established by both com-
3072 panies had a transmission capacity of 45,000 kilowatts which was specified in the contract as the capacity which each company should make available to the other for emergency service.

This extension consisted of number 4/0 copper conductor on double-circuit steel towers, only a single circuit of conductors being installed.

In 1935, the interconnection with Public Service Company of northern Illinois was discontinued. The Illinois company removed sections of its line and subsequently Wis-

consin Electric Power Company took down portions of its line and used the materials elsewhere on its transmission system.

Q. Now, that line running from the spur is not shown on the map? A. No. The spur extending wes from Kenosha represents that portion of the line which still remains completely in place.

Q. And that is how long? A. That is 1.64 miles long. The entire extension from Kenosha to the Illinois line, including the spur shown on the map, was about nine miles 3074
long.

Subsequent to the discontinuance of the interconnection at the Illinois line, Wisconsin Electric Power Company, as I have stated, used portions of the materials of this line at

—1,440—

other places on the system and during the course of the years has removed two 132,000 volt oil circuit breakers.

I should explain here that these circuit breakers, although they were installed for the purpose of ~~serving this~~ transmission connection, were installed in the Albers Street sub-station of the Wisconsin Gas & Electric Company and 3075
belonged to that company.

They have been removed, however, and installed at other points on the systems of Wisconsin Electric Power Company and Wisconsin Michigan Power Company.

There have also been removed from the Illinois extension 3.2 miles of the copper conductors, all three wires being taken down for that distance. Four-tenths of a mile of conductors and insulators have been removed and 4.1 miles of all the insulators on the line, with the exception of one on each conductor, have been removed.

The single insulator was left up in the case of this distance in order to make it possible to leave the wire in place, since no need for the wire had at that time been found.

Q. Are the steel towers still in place, however? A. Yes, all of the steel towers are still in place.

We estimate that it would cost approximately $55,000.00 to restore this line to its original operating condition.

Q. Now, on Respondents' Exhibit No. 32 there are other lines shown, originating at the Lakeside Power Plant. Is

3077 —1,441—

there a so-called Lakeside-Granville line? A. Yes, there is.

Q. Will you describe it? A. I explained that the circuit from the Lakeside Plant to the Appleton Sub-station is regarded as one circuit or one line, and that that circuit is carried on one side of double-circuit steel towers extending from the Lakeside Plant to Appleton.

Between the Lakeside Plant and the Granville Sub-station there is another circuit carried on the opposite side of these same towers.

Q. I don't believe you have located the Granville sub-
3078 station. Will you locate it on the map? A. The Granville sub-station is located near the community of Granville which appears in the northeast corner of Milwaukee County.

It is approximately due west from the village of Fox Point which is located on the shore of Lake Michigan at about the same latitude.

The Lakeside-Granville line consists of twenty-five miles of circuit, the circuit being three number 4/0 aluminum cables, steel reenforced. They occupy one side of the towers which were built in 1925.

In 1931, a 132,000 volt sub-station was built at 28th Street in Milwaukee. This sub-station apears on Exhibit 32 immediately to the left of the steam power plant symbol

—1,442—

designating the East Wells Street Power Plant.

It was installed for the purpose of furnishing an additional source of large quantities of power for the industrial area in the city of Milwaukee.

A line serving this sub-station was built consisting of a
double-circuit, three hundred thousand circular mil copper 3080
line on steel towers. This line extended from the 28th Street sub-station to the Lakeside-Granville line. At the same time this circuit was constructed, conductors of the same size were substituted for the number 3/0 and number 4/0 aluminum cables which prior to that time were in place between the Lakeside plant and the point where the 28th Street sub-station tap connects with the circuit, so that from Lakeside to the 28th Street sub-station, there are now two circuits of 300,000 circular mil copper conductors, each circult carried on one side of one row of double-circuit steel towers.

These circuits operate at 132,000 volts and have a trans- 3081
mission capacity of 90,000 k. v. a.

The 28th Street sub-station also has a capacity of 90,000 k. v. a.

Q. What is the function of the Lakeside-Granville line?
A. The function of the Lakeside-Granville Line is to carry

—1,443—

power from the Lakeside Plant to the Granville Sub-station.

The Granville Sub-station serves a very heavy industrial load in the northwestern portion of the city of Milwaukee and in the suburbs in that portion of Milwaukee County.

The Granville sub-station is classified in our property accounts as a transmission sub-station, but in addition to its transmission functions, it also serves as a major point of distribution of power to heavy customers.

Q. On Respondents' Exhibit No. 32, various lines are shown as originating at the Port Washington generating station. Will you describe the lines of the Wisconsin Electric Power & Light originating at that station? A. The line extending to the west from Port Washington and connecting
3083 with the 132,000 volt Lakeside-Appleton line, was built at the same time the Port Washington Power Plant was built.

Its purpose is to provide an outlet for a major portion of the power generated by the Port Washington Plant. This line consists of two circuits, one extending from the Port Washington Power Plant Sub-station to Saukville, at which is located the junction of the Port Washington line and the Milwaukee-Appleton line.

Another circuit extending from Port Washington passes through Saukville and then turns south and follows the route of the Lakeside-Appleton line to the Granville Sub-station,

3084

—1,444—

a distance of twenty-three miles.

The circuit from the power plant sub-station to Saukville consists of 300,000 circular mil copper on double-circuit steel towers and the circuit from the Port Washington Substation to the Granville Sub-station also consists of 300,000 circular mil copper conductors, that portion south of Saukville occupying the previously vacant side of the steel towers in the Lakeside-Appleton line.

 3085

At the time these circuits were installed, new conductors were put on the opposite side of the towers from Saukville to Granville.

These new conductors were of the same kind as those extending to the Port Washington Plant and replaced the 4/0 copper erected in 1923—I am sorry; I made an error there. It replaced the old 3/0 aluminum cable, steel reenforced, which was erected in 1923 by number 4/0 copper conductors, stranded copper.

These circuits and the changes in conductor sizes which 3086
were made between Saukville and Granville have provided an outlet with a capacity of 90,000 k. v. a. for the Port Washington, Plant, although not all of the output of that plant comes out over the 132,000 volt lines.

Some of it is taken off through the 26,000 volt sub-station and the 26,000 volt lines which are fed by it.

Q. Does Wisconsin Electric Power Company have other

—1,445—

transmission lines which are not shown on Respondents' Exhibit No. 32? A. Wisconsin Electric Power Company has transmission lines other than those I have described which 3087
are shown on Exhibit 32.

Q. All right. Begin with those, if you will, and describe them. A. All the transmission lines of Wisconsin Electric Power Company which I have not already described operate at 26,400 volts.

Q. That is to say, all lines shown on the map that you have not described, is that true? A. Yes. These lines serve to connect the high-voltage sub-stations which feed the distribution system. In constructing these lines, a point has

been made of producing parallel or loop circuits wherever economically possible in order to provide alternate routes of power in case of outages on any particular sections and by that means reducing the probability of service interruptions.

The principal lines among those operating at 26,400 volts which are shown on Exhibit 32, include a line extending from the Lakeside Power Plant to the Racine Power Plant. This line is shown on Exhibit 32, following a route beginning
3089 at the Lakeside Power Plant, then passing through Cudahy, South Milwaukee, and Carrollville to Racine.

—1,446—

This line has a total length of twenty-four miles, of which twenty-two miles are carried on wood pole supports and two miles are carried in underground conduit.

Extending from this line at a point just south of the Racine County line, a small tap or spur extends to the west to a point of interconnection with Wisconsin Gas & Electric Company.

3090 The twenty-four mile length which I have just given includes the length of that tap. This line carries energy from the Lakeside Power Plant to the Racine district and was one of the principal sources of power for the Racine district prior to the construction of the Lakeside-Kenosha 132,000 volt line.

Another 26,400 volt line of importance in the system of Wisconsin Electric Power Company is one extending from the West Allis Sub-station whose location I have previously described, to Waukesha. This line has a total length of twelve miles and consists of number 1/0 copper, carried on

wood poles. Its function is to deliver energy from the West Allis Sub-station which is fed by lines from the Lakeside Plant to the Waukesha sub-station for distribution in that area over the system of Wisconsin Gas & Electric Company.

Another line which parallels the one I have just described extends from the Lakeside Plant around and through the West Allis Sub-station, then west to Waukesha.

—1,447—

This line serves, in general, the same functions as the line from the West Allis Sub-station to Waukesha, except 3092
that it extends on through to the Lakeside Plant where it derives its source of power.

It also serves to furnish energy to the West Allis sub-station for distribution in the area served by that sub-station. This circuit consists of number 1/0 and number 4/0 copper and is about twenty-five miles in length. There is also another circuit operating at 26,400 volts extending from the Lakeside Power Plant to the West Allis Sub-station.

This one is eleven miles in length, of which ten miles are carried on wood poles and one mile is in underground conduit. The portion carried overhead consists of number 4/0 3093
stranded copper and the portion lying underground consists of 300,000 circular mil copper conductors.

A 26,400 volt line extends from the Waukesha Sub-station to the Watertown Sub-station, a distance of thirty-five miles.

This circuit consists of number two copper conductors carried on wood poles for the entire distance. It operates generally in parallel with the circuits I described previously as being operated temporarily at 26,400 volts and prior to the time that those circuits were operated at that voltage

3094 this circuit served to deliver energy to the 26,400 volt sub-stations located along the route between Waukesha and

—1,448—

Watertown.

Another circuit operating at 26,400 volts extends from West Allis to Watertown. I would like to correct that. It extends from West Allis to Burlington and East Troy.

That line may be found on the map by starting at the point marked West Allis and traveling generally south to
3095 St. Martins and then following two branches, one nearly west, but slightly south, through Muskego, Big Bend and Mukwonago to East Troy, where the East Troy Sub-station is located, and the other branch leading southwest from St. Martins through Wind Lake, Waterford and Rochester, to the Burlington Sub-station.

The total length of this line is forty-seven miles of number two copper carried on wood poles, and six miles of number 3/0 aluminum cable, steel reenforced, carried on wood poles.

The line receives energy from the West Allis Sub-station
3096 and delivers that energy to the various points along its route and to the sub-stations at East Troy and Burlington. At East Troy the energy received from this line is stepped down to lower voltages and delivered to other lines which distribute it in the East Troy district and surrounding rural areas.

At Burlington, the energy which is delivered by this line is partly converted to lower voltages for distribution by Wisconsin Gas & Electric Company in the Burlington area,

—1,449—

and is partly received at line voltage and taken out on the 26,000 volt lines of Wisconsin Gas & Electric Company.

A 26,400 volt line connects the sub-stations at Burlington and East Troy. This line passes through the community of Honey Creek. It is thirteen miles long and consists of number two solid copper conductors supported on wood poles. It furnishes a source of power for the Honey Creek district and forms a loop circuit bounded by East Troy, Burlington and St. Martins, making it possible to carry
service to practically any point on the loop regardless of 3098
where an interruption might occur.

Another 26,400 volt line is operated by Wisconsin Electric Power Company between Cedar Grove and Weedens in the northern portion of the territory served by Wisconsin Gas & Electric Company.

This line has as its purpose the delivery of energy to railway sub-stations located at Oostburg and Weedens. These railway sub-stations have recently been taken out of service because of the abandonment of interurban railway operations of the Milwaukee Electric Railway and Transport Com-
pany on the line north of Port Washington. 3099

Q. The line you last referred to is in Sheboygan County? A. Yes, it is.

Another 26,400 volt line is operated by Wisconsin Elec-

—1,450—

tric Power Company between the cities of Racine and Kenosha. This one is indicated by the line colored red lying immediately to the left of the gas transmission main indicated between those cities.

Its length is ten miles and it consists of 1/0 and 4/0 copper conductors carried on wood poles. This is one of the

lines I previously referred to as formerly furnishing power to Kenosha before the construction of the 132,000 volt line from Lakeside to Kenosha.

It still carries substantial quantities of energy and furnishes valuable reserve transmission facilities to guarantee continuity of service in the Kenosha area.

A 26,400 volt line extends from the Granville Sub-station to Port Washington. It is twenty-four miles long and consists of number three, number two and number 4/0 copper
3101 conductors.

The conductors are carried on wood poles over the entire length of the line. The purpose of this line is to furnish service to sub-stations at Brown Deer, Thiensville and Grafton.

Another 26,400 volt line of Wisconsin Electric Power Company extends from the Granville Sub-station south and west to Waukesha. This line supplements the lines serving Waukesha from West Allis and Lakeside and carries energy to communities located along the route, among which are Brookfield and Elm Grove.

3102 —1,451—

It also serves the County Line Sub-station which appears on Exhibit 32 in the immediate vicinity of the community of Elm Grove.

There are other 26,400 volt lines of Wisconsin Electric Power Company which are classified as transmission lines, but which, because of their short length and the density of what we have already shown on Exhibit 32, were omitted from the map.

For the most part, they serve as loop or parallel circuits to the circuits which I have described and it was felt

that their omission from the map would not detract from the extent of the coverage of the territory which is accomplished by the facilities shown.

Q. Have you referred to the line from Racine to Burlington? A. No, I haven't. I overlooked that one. That is a rather important line. That is, it is important in the operation of the transmission and distribution facilities in the Burlington district, particularly with respect to Wisconsin Gas & Electric Company.

This line extends from the Racine Sub-station southwest 3104
out of the city of Racine and then nearly due west past the communities of Sturtevant and Union Grove, at which points energy is delivered to sub-stations of Wisconsin Gas & Electric Company and then west and slightly south into

—1,452—

Burlington. This line is twenty-eight miles long and consists of number 1/0 copper conductors carried on wood poles. It is a single circuit line operating at 26,400 volts.

Q. And again, energy is delivered at Burlington through the system of Wisconsin Gas & Electric Company? A. Yes.
Energy is delivered at the Burlington Sub-station for the 3105
use of Wisconsin Gas & Electric Company.

The Examiner: Let us have a recess of five minutes.

(Whereupon, a short recess was taken.)

By Mr. Hamilton:

Q. What is the circuit mileage in the transmission system of the Wisconsin Gas & Electric? A. The transmission

system of Wisconsin Gas & Electric Company includes 401 miles of transmission circuits which are carried on 376 miles of wood pole lines. All of these lines operate at 26,400 volts except 6.6 miles of line which operate at 13,200 volts.

Q. Now, will you describe the principal transmission lines in the Wisconsin Gas & Electric Company system? A. Wisconsin Gas & Electric Company operates a double-circuit 26,400 volt line extending from Racine to Kenosha. It appears on Exhibit 32 as the line colored yellow, lying on the
3107 left of the one colored red between these two cities. This line is eleven miles long and consists of number 4/0 stranded

—1,453—

copper conductors.

It operates generally in parallel with the circuit of Wisconsin Electric Power Company extending between Racine and Kenosha.

The circuit from Kenosha to Burlington which is operated by Wisconsin Gas & Electric Company, is thirty-two miles long. Leaving Kenosha, it extends to the west and south through the communities of Pleasant Prairie and Salem and
3108 then extends northwest into Burlington.

Twenty-three miles of its length are made up of number four copper conductors and nine miles are five-sixteenth inch stranded steel cable. The entire length of the circuit is carried on a single line of wood poles.

This circuit takes energy which is delivered by Wisconsin Electric Power Company at the Kenosha Sub-station and delivers it to the communities through which it passes and to the Burlington Sub-station at certain times. At other times the circuit serves to take energy from the Burlington

Sub-station and deliver it to the communities located along the route.

Wisconsin Gas & Electric Company operates a 26,400 volt transmission circuit extending from Whitewater to Burlington. This circuit is thirty-nine miles long and consists of number two copper and number four copper conductors. The conductors are double, however. That is, there are two wires instead of one.

—1,454—

There are six wires carried on the poles, but it is operated 3110
as one circuit with double-conductors. The line receives energy from the Whitewater Sub-station of Wisconsin Gas & Electric Company and delivers it in the direction of Burlington, some of the energy actually reaching Burlington but most of it being taken off at the Elkhorn Sub-station and at the points of interconnection with Wisconsin Power & Light Company in Walworth County.

This circuit serves to complete a loop between Whitewater, Burlington, and St. Martins, utilizing the section of 132,000 volt line from Lakeside as one of the possible sources in serving this district. That is, it is possible to deliver 3111
energy to Burlington from Whitewater even though the other lines leading into the Burlington Sub-station should be interrupted.

Likewise, should service to this line be interrupted, the Burlington Sub-station could be served by the lines coming into it from the east and north.

Wisconsin Gas & Electric Company also operates a 26,400 volt circuit between the cities of Whitewater and Watertown. The one which I shall now describe is the more westerly one of the two connecting these cities.

It is thirty-two miles long and follows a route that passes through the city of Fort Atkinson and the community of Johnson Creek, then continues north into Watertown. It

—1,455—

consists of number two copper and number four copper conductors.

Here, again, the conductors are double, although the line operates as one circuit.

Another line between Whitewater and Watertown follows
3113 a more easterly route for a length of twenty-seven miles. It consists of number 1/0 copper conductors carried on wood poles. These two circuits operate in parallel between the cities of Whitewater and Watertown and serve to carry energy in either direction from the power sources at both points.

The power furnished at Whitewater and Watertown comes from the system of Wisconsin Electric Power Company.

A 26,400 volt circuit of Wisconsin Gas extends from the village of Waterloo, which appears in the northwest corner
3114 of Jefferson County, to a point known as Aztalan Junction, which is located at the junction of the transmission lines west of Johnson Creek.

The circuit is fifteen miles long and consists of number four copper conductors carried on wood poles. This circuit serves to carry energy from the system of Wisconsin Gas & Electric Company to the village of Waterloo which operates a municipal distribution system.

Wisconsin Gas & Electric Company also has a distribution sub-station at Waterloo which is used in serving rural territory in that general district. —1,456—

Another circuit of Wisconsin Gas & Electric Company extends from the line just described at a point south of Waterloo west through the community of Marshall, and south to the village of Deerfield where it feeds a sub-station serving the municipal distribution system of the village.

This circuit is ten miles long and consists of number two solid copper conductors on wood poles.

Another section of 26,400 volt line operated by Wisconsin Gas & Electric Company extends from the sub-station at Waterloo north and slightly east to the community of Reese- 3116
ville, which does not appear on Exhibit 32, but is located at the junction of the lines southwest from the community of Lowell.

This line is nineteen miles long, including the extension to Lowell, and consists of 3/0 aluminum and 4/0 aluminum conductors carried on wood poles.

Another section of line operated by Wisconsin Gas & Electric Company, but not owned by the company, extends from Watertown northwest to the junction southwest of Lowell. This line operates at 26,400 volts and is leased from Wisconsin Power & Light Company. 3117

Formerly, it was used by Wisconsin Power & Light Company in delivering the 25-cycle 66,000 volt energy which Wisconsin Electric Power Company purchased at Watertown.

Since the termination of the delivery of 25-cycle energy

to Wisconsin Electric Power Company at Watertown, Wisconsin Power & Light Company has had no use for this section of its line and is now leasing it to Wisconsin Gas & Electric Company.

The line is shown on Exhibit 32 as a line operated by Wisconsin Gas & Electric Company, but I wanted to make it clear on the record that the showing of it on the map is not intended to convey the impression that the line is owned by Wisconsin Gas & Electric Company.

Another section of 26,400 volt line which is operated by Wisconsin Gas & Electric Company extends from the community of Jefferson east and south to the community of Rome, where a distribution sub-station is located.

3119 This circuit is eleven miles in length and consists of number two copper conductors carried on wood poles. It furnishes energy which is stepped down to distribution voltages at Rome and is distributed in the community and rural territory surrounding.

A 26,000 volt line extending from the Granville substation north and west to the community of Eden is operated by Wisconsin Gas & Electric Company.

This line passes through Menominee Falls, Addison, Theresa, Brownsville, and terminates in a short spur north of the community of Eden.

3120 Its total length is fifty-six miles. The conductors con-

—1,458—

sist of number two copper and number four copper wires which are carried on wood poles for the entire length of the circuit.

This line receives energy from Wisconsin Electric Power Company at the Granville Sub-station and transmits it to the various sub-stations located along the route.

A 26,000 volt line extending from the community of Lomira, which is located in the northeast corner of Dodge

County, to Kewaskum in the northern part of Washington County, is also operated by Wisconsin Gas & Electric Company.

This line is seventeen miles long and consists of number two copper wires carried on wood poles.

From Port Washington, a 26,400 volt line of Wisconsin Gas & Electric Company extends north through Belgium and Cedar Grove, then west through Random Lake and further west to a point north and slightly west of Kewaskum.

This circuit is thirty-four miles long and consists of 3122
number two copper conductors on wood poles for its entire length.

This circuit completes a transmission loop extending from Port Washington through Cedar Grove, through Lomira, Addison, and down to Granville, and makes it possible for Wisconsin Gas & Electric Company to render uninterrupted service to the communities located in this general district. There is also a 26,400 volt line between the city of West

—1,459—

Bend and the village of Addison, both in Washington County.

This circuit is ten miles long and consists of number 3123
two copper, carried on wood poles. A circuit is now under construction between the city of West Bend and the village of Kewaskum, as indicated by the dotted line in Exhibit 32. When this circuit is completed, it will complete another loop in the transmission circuit lying generally between West Bend and Lomira.

Q. What will be the voltage of that? A. The voltage of that line will be 26,400 volts. Wisconsin Gas & Electric Company also operates a 26,400 volt transmission circuit extending from West Bend to Port Washington.

This circuit is eighteen miles long and has number 1/0 copper conductors. It serves as a source of supply for the West Bend district, the energy being received from Wisconsin Electric Power Company at the Port Washington sub-station.

Another transmission line of Wisconsin Gas & Electric Company extends from Port Washington south and west through Grafton, Cedarburg, Thiensville, and Brown Deer, and terminates at the territorial boundary line north of Milwaukee.

3125 This line is twenty-two miles long. The conductors are number two solid copper and are carried on wood poles.

The line is energized at either end at different times, sometimes receiving energy from the Fairmount Sub-station of Wisconsin Electric Power Company which is located

—1,460—

within the Milwaukee metropolitan area, and sometimes receiving energy at the Port Washington end.

It serves the communities of Grafton and Thiensville and adjacent territories.

Wisconsin Gas & Electric Company also operates a trans-
3126 mission line at 26,400 volts between the city of Menominee Falls and the village of Merton, both of which are in the northern portion of Waukesha County.

This line receives energy delivered to the system of Wisconsin Gas & Electric Company at the Granville Sub-station and carries it west through the communities of Sussex and Merton, serving those communities and adjacent areas.

When I gave the total mileage of transmission circuits operated by Wisconsin Gas & Electric Company a few moments ago, I stated that 6.6 miles of such circuits consisted of 13,200 volt line.

This line extends from the Elkhart Lake Sub-station to the city of Kiel located in the southwest corner of Manitowoc County.

This line consists of number two copper conductors carried on wood poles and serves the function of transmitting energy from the Elkhart Lake Sub-station of Wisconsin Gas & Electric Company to the municipal utility at Kiel.

It furnishes the only source of supply for the municipal

—1,461—

system. 3128

Q. And that line is energized how? A. It is interconnected with the system of Wisconsin Electric Power Company through the 132,000 volt sub-station of Wisconsin Gas & Electric Company at Elkhart Lake.

Q. You have indicated, I think, that these lines which you describe, are the principal transmission lines of Wisconsin Gas & Electric Company. A. Yes, they are the principal lines and if one were to add the mileages that I have given as the length of these respective lines, the total mileage would not equal the total mileage operated by Wisconsin Gas & Electric Company because there are some shorter 3129
circuits which I have not described.

The reason I haven't described them is the one I gave in connection with the Wisconsin Electric Power Company; namely, that they are shorter and serve generally as parallel or loop connections between these principal circuits, and that the circuits shown and described indicated in general the complete coverage of the territory made by the transmission system.

Q. What is the circuit mileage in the transmission system of Wisconsin Michigan Power Company? A. Wisconsin

Michigan Power Company operates 845 miles of transmission lines. These lines operate at five different voltages.

—1,462—

147 miles of the transmission lines of Wisconsin Michigan Power Company operate at 132,000 volts. Of those, 137 miles are in Wisconsin and ten miles are in Michigan.

The 66,000 volt lines of Wisconsin Michigan Power Company have a total length of 221 miles, of which 51 miles are located in Wisconsin and 170 miles in Michigan.

3131 The 33,000 volt transmission lines of Wisconsin Michigan Power Company comprise a total length of 211 miles, all of which are in the state of Wisconsin, none being in Michigan.

Wisconsin Michigan Power Company operates 260 miles of 13,800 volt lines which are classified as transmission. Of these lines, 57 miles are in Wisconsin and 203 miles in Michigan.

The company also operates six miles of line at 11,400 volts which are classified as transmission lines.

3132 The total mileage of transmission lines operated by Wisconsin Michigan Power Company is made up of 456 miles in Wisconsin and 389 miles in Michigan, making a total of 845 miles.

Q. Now, will you describe the line running from Appleton easterly and then in the northerly direction on up into Dickinson County? A. The line you have just mentioned is the only 132,000 volt line owned and operated by Wisconsin Michigan Power Company.

—1,463—

Its total length is 147 miles. It was constructed in 1925 for the purpose of furnishing an interconnection between the power plants and transmission facilities in the northern portion of the company's territory and the power plants and transmission facilities in the southern portion.

The length of 147 miles which I have given, includes the tap or spur which extends east from the line in Marinette County to the two hydro-electric plants on the Menominee River.

The upper one of these plants is the Chalk Hill Plant 3134
and the lower is the White Rapids Plant which I described yesterday.

This line was constructed in three sections, one extending from Appleton to Green Bay, the second extending from Green Bay to Amberg, Wisconsin, which is located at the junction of the lines in Marinette County, and the other section extending from Amberg north into Michigan to the high-voltage sub-station at the Twin Falls hydro-electric plant north of Iron Mountain.

The first section extending from Appleton to Green Bay
and the third section extending from Amberg to Twin Falls 3135
consists of a single circuit of number 4/0 aluminum cable, reenforced, supported on one side of double-circuit steel towers.

—1,464—

The second section—before proceeding with the second section, I would like to add that the first and third sections were built by Wisconsin Michigan Power Company and were owned in total by the company at the time they were built.

The second section extending from Green Bay to Amberg consisted of number 4/0 aluminum cable, steel reenforced

conductors, which were installed along with their insulators on the vacant side of a string of double-circuit steel towers which were at that time owned by Northern Electric Company, a predecessor to Northern Paper Mills which I mentioned yesterday as the firm from which the Chalk Hill and White Rapids hydro-electric plants were purchased by the company.

The company at that time leased conductor space from Northern Electric Company and installed its own insulators
3137 and conductors on the towers.

Q. When you say "company," you refer to Wisconsin Michigan Power Company? A. Wisconsin Michigan Power Company leased the conductor space and installed the conductors.

From Appleton to Forest Junction, which is the point east of Appleton at which the two lines part, one going north and one going south, the conductors are supported on the opposite side of the same towers which support the Lakeside-Appleton circuit of Wisconsin Electric Power Company.

3138 Over that length of line, a distance of fourteen miles,

—1,465—

the right-of-way and towers are owned jointly by Wisconsin Electric Power Company and Wisconsin Michigan Power Company.

The conductors and insulators are owned individually by the respective companies.

Now, prior to the construction of this line from Appleton to Twin Falls, the only outlet for the power generated

 3139

by the hydro-electric plants in the northern district was the market located within that district. That market was at times rather limited and as a result the hydro-electric plant wasted considerable water which was within their capacity to utilize, simply because they had no outlet for the power that the use of that water would have generated.

When the line was placed into operation, however, an outlet for that surplus of energy was provided and from that time on the plants have been able to utilize all available water within the capacity of their wheels, and have sent 3140
south over this transmission line all portions of their generation which has not been required for distribution in serving the loads in the northern division.

I made a study to ascertain the approximate extent to which the output of the plants in this region was increased through the construction and operation of this line. Using the output of the Twin Falls Plant as an indicator, I found that by comparing the two years preceding 1925 and the two years following 1925, that the output of the Twin Falls Plant

—1,466—

was increased between thirty-five and forty per cent. through 3141
the availability of an outlet for the energy above local requirements.

Now, in making that analysis, I included only the flow available in the Menomonee River up to the capacity of the wheels in the plant. Obviously, any flows above that could not be used by the plant whether it had a load or not. It could only utilize its wheel discharge capacity.

I also recognized the fact that the discharge of the stream within the capacity of the wheels was different in

these four years that I considered in making the comparison, so that the increased output which was indicated by the study recognizes all the variables that were involved between the two years prior to the construction of the line and the two years following the construction of the line so that it can be said that the indicated increase in output is in no way due to any change in water conditions, but is due entirely to a change in market conditions.

Now, using Twin Falls as a sample for all the plants in
3143 the area, and it is fairly representative with respect to stream flow characteristics and general relationship of output to stream flow, I find that the annual output which is being now realized in that area in excess of what was realized before, runs in the neighborhood of 30,000,000 kilowatt hours a year.

—1,467—

In 1926 and 1927, the first two years after the line went into operation, the records of Wisconsin Michigan Power Company and Wisconsin Electric Power Company, show that an average of 32,000,000 kilowatt hours were delivered to
3144 Wisconsin Electric Power Company through the operation of this line.

If that line had not been in place, that energy could not have been delivered by the plants and would have been wasted in the form of spilled water.

Q. Isn't it true that this line makes available to the Wisconsin-Michigan territory indicated on the map as centered about Appleton, electric energy generated by all the hydroelectric plants in the Wisconsin Michigan Power Company in the northern territory? A. Yes, it is possible for energy

generated at any of the plants in the northern portion of the Wisconsin Michigan Power Company system to be delivered to Appleton because the electrical connection between those plants and Appleton is continuous.

It would be impossible to say with any degree of certainty that kilowatt hours generated, for instance, at the Pine River Plant were delivered on the bus at Appleton because we can't identify kilowatt hours.

All of the energy generated in that northern system goes into a pool represented by the high-voltage transmission line 3146

—1,468—

and comes out of that pool at Appleton, but it is entirely possible for energy from any one of those plants to reach the Appleton load.

Q. And the same comment would equally be true of the Diesel engine plant at Iron River? A. In that case, it is possible, but less probable.

Q. Because of the output? A. Because of the nature of operation of the plant. The Diesel Plant at Iron River, as I explained yesterday, is operated only periodically and under sufficient load just to assure the operators that it is in 3147
operating condition and would be available if emergency required it; but the amount of energy it generates is so small that one would be fairly safe in saying that none of that energy would travel as far as Appleton.

It would be absorbed by the local loads.

Q. But it would get into the lines? A. It would get into the lines, yes, and theoretically it would be co-mingled with other kilowatt hours and might go to any part of the system.

Q. And because of the Wisconsin Electric Power Company line from Appleton, running down to Milwaukee, isn't

3148 it also possible that the power generated in this northern territory might come even farther down into the Wisconsin Electric and Wisconsin Gas territory indicated on the map as centering about Milwaukee? A. Yes, that is possible, and

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we know it happens. That is, during the seasons of the year when the streams are running high in Michigan, the hydroelectric plants in the northern portion of the Wisconsin Michigan Power Company system operate at full capacity
3149 twenty-four hours a day for as much as three or four or even five weeks in the spring. During that period considerable quantities of energy are generated and are transmitted south over the line to Appleton and then on south into the system of the Wisconsin Electric Power Company.

Q. Now, is there a transmission line running from Twin Falls to Iron River, and is that line indicated on the map, Exhibit No. 32? A. The answer to both parts of your question is yes. The line you mentioned has its eastern terminus at the Twin Falls Plant located on the map north of the city of Iron Mountain.

3150 Beginning at that point and following the line to Iron River, one would cross the Menominee River at the Twin Falls Plant, entering Wisconsin, then following it northwesterly you would pass the community of Florence and then swinging still further to the northwest would cross the Brule River into Michigan to a point south of Alpha.

Then continuing westerly and northerly through the com-

—1,470—

munities of Caspian and into Iron River. That line is a double-circuit line operating at 66,000 volts.

The conductors are of various sizes including number 1/0 aluminum cable, steel reenforced, number 1/0 stranded copper, and number 2/0 stranded copper.

These conductors are supported on double-circuit steel towers.

The line was built in 1912 in the same year in which Peninsular Power Company built the Twin Falls hydro-electric plant. At that time also, Peninsular Power Company built a steam generating station in the city of Iron River. That steam station and the Twin Falls hydro-electric plant con- 3152
stituted the only sources of power of the Peninsular Power Company system at that time and the 66,000 volt line we are discussing was constructed to connect those sources and make them available to each other for coordinated operation.

During the seasons of high flow in the Menominee River and seasons of moderate flow, the Twin Falls Plant was able to generate enough power to carry most of the load of the system and a large part of its generation was transmitted in the direction of Iron River.

During seasons of deficient flow, the Twin Falls Plant 3153
generated as much as could be generated with the water available and its inadequate supply was made up by power generated in the steam plant at Iron River and that make-up energy was transmitted in the direction of Twin Falls.

—1,471—

This line was originally built on what were called black iron towers as distinguished from our present-day galvanized towers.

At that time, it had conductors of smaller sizes than those now in place. As load conditions improved and

greater transmission capacity was required, the conductors were changed to others of larger sizes and in 1928 the Wisconsin Michigan Power Company, which had meanwhile acquired the property of—correction—the Wisconsin Michigan Power Company which had meanwhile succeeded Peninsular Power Company, began a program of reconstructing the towers along the line.

The original towers were rusting rather badly and were
considered unsafe, especially in view of the heavy conductors
3155 that had been strung on them. So a program was put under
way to replace the old black iron towers with modern galvanized towers.

That program has not yet been completed but it is well along and is still under way. The substitution of the higher grade steel towers for the old iron ones will improve the stability of the line and the management feels that it is a step in the right direction towards increasing reliability of operation at that portion of the system.

Q. Have you given the length of that line? A. I don't

—1,472—

3156 think I did. The line is thirty-six miles long from Twin
Falls Sub-station to the Iron River Sub-station.

Q. Now, is there a transmission line to Crystal Falls? A. Yes, there is a line which we refer to as the Crystal Falls Branch Line which extends from the vicinity of Crystal Falls south through the village of Alpha, and then south further a short distance to a point where it connects with the Twin Falls Iron River Line.

The Crystal Falls Branch line operates at 66,000 volts and has a total length of eight and a half miles. This line

was built in 1913 and furnished a supply of high-voltage energy to iron mines and other users in the Crystal Falls region.

As the loads served by this branch line increased, it was necessary to increase the carrying capacity of the line, so the conductors were replaced with others of larger size. As now constituted, the line consists of two circuits of number 1/0 aluminum cable, steel reenforced, from the junction with the Twin Falls-Iron River Line to Alpha and from Alpha
to Crystal Falls it consists of one circuit of number 2/0 3158
aluminum cable, steel reenforced. The entire length of the line is carried on steel towers.

Mr. Hamilton: Is this an appropriate time to recess for lunch?

The Examiner: Yes, I think it is. We will recess until 2:00 o'clock.

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(Whereupon, at 12:30 o'clock p. m., the hearing recessed until 2:00 o'clock p. m.)

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—1,474—

Afternoon Session

(Whereupon, at 2:00 o'clock p. m., September 10, 1940, the hearing reconvened.)

The Examiner: You may proceed.

Edward H. Schmidtman the witness on the stand at the time of recess, resumed the stand, was examined and testified further as follows:

3161

Direct Examination by Mr. Hamilton (Continued):

Q. I believe you had finished describing the so-called Crystal Falls Branch transmission line. Are there other transmission lines in the territory in and about the Brule River and the Pine River? A. Yes, there are. As indicated on the map, Exhibit 32, there is one line connecting the Pine River hydro-electric plant with the 66,000 volt line extending from Twin Falls to Iron River.

This line was built at the time the Pine River Plant was
3162 built in 1922. It is six miles long and consists of two circuits
of number three copper conductors carried on steel towers.

The other line which leads to the south and east from the Pine River hydro-electric plant is a lower voltage line which performs the function of carrying electrical energy to the community of Aurora and other districts in that portion

of the company's territory.

Another 66,000 volt tap line was built from the Brule River Plant to the Iron River-Crystal Falls line in 1919 at the time of construction of the Brule River Plant.

The map shows two lines extending from the Brule River hydro-electric plant, one leading southwest to the community of Florence, and the other leading southwest to a point nearer to the Wisconsin-Michigan boundary line.

The latter one of these two is the 66,000 volt line being described. The former operates at 6600 volts and serves to carry energy from the Brule River Plant to the community of Florence.

The 66,000 volt tap line consists of two circuits of number 1/0 aluminum cable, steel reenforced, carried on steel 3164
towers.

Both the Pine River Plant tap line and the Brule River tap line deliver energy from their respective plants into the 66,000 volt transmission system of Wisconsin Michigan Power Company.

Q. Now, there appears on Exhibit No. 32 a line running from Crystal Falls to Iron River. Will you describe that line? A. That line was built in 1929 for the purpose of forming a loop circuit between Crystal Falls and Iron River and the Iron River-Twin Falls transmission line.

—1,476— 3165

It consists of a single circuit of number two copper conductors carried on wood poles and operating at 66,000 volts.

This line is fourteen miles long.

The loads in the Crystal Falls area had shown considerable growth subsequent to the construction of the Crystal Falls branch line and it was felt that it would be wiser to meet those increasing needs by construction of the line to Iron River than by increasing the capacity of the Crystal Falls branch line.

Q. And from Iron River running in a southwesterly direction, there appears still another line on the map. Will you describe it? A. This line, as shown on the map, leads from the sub-station at Iron River southwesterly into Wisconsin, then west through Phelps, and north back into Michigan, passing through the communities of Land-o-Lakes, and Watersmeet, and terminating at the 66,000 volt sub-station at Bruces Crossing.

This line consists of one circuit of number 1/0 aluminum
3167 cable, steel reenforced, carried on wood poles. The length is sixty-five miles from Iron River to Bruces Crossing.

The purpose of constructing the line, which was built in 1929, was to furnish power to new territory which was being developed by Wisconsin Michigan Power Company at that time.

This line carries energy which it receives at Iron River

—1,477—

up to the Bruces Crossing Sub-station where it is stepped down to lower voltages for transmission and distribution over the lines emanating from that point.

3168 It also furnishes energy to sub-stations located at Phelps, Land-o-Lakes, and Watersmeet.

Q. Will you describe the Twin Falls-Cornell transmission line? A. The 66,000 volt line extending from Twin Falls to Cornell travels in a northerly direction from Twin Falls and then turns east at a point near Sagola, which is not named on the map, continues east through the community of Felch, and then bears southeasterly, terminating at Cornell, where a 66,000 volt sub-station of the Wisconsin Michigan Power Company is located.

 3169

This line has one circuit of number 1/0 copper conductors and is carried on wood poles. It has a total length of fifty-two miles.

It was built in 1931 for the purpose of serving new territory that was being developed by the company in the eastern portion of the Michigan electric territory.

It delivers energy to the distribution sub-station at Felch and to the transmission sub-station at Cornell. The Cornell sub-station steps the voltage down to 13,800 volts for delivery to the line which extends to the north and east from 3170

—1,478—

Cornell, with a spur to Perkins and terminating at Trenary.

The Cornell sub-station also supplies energy to a 13,800 volt line which extends to the west along the route of the 66,000 volt line to Cornell, and then turns south connecting with a 13,800 volt line extending east from Iron Mountain and passing through Norway and Loretto, and Spalding, terminating at Bark River.

The latter line is the one to which the Sturgeon River hydro-electric plant shown on the map near the community of Loretto delivers its output at 13,800 volts. That portion 3171
of the output of this plant, which is not consumed on the easterly portion of this 13,800 volt line, is delivered to the sub-station at Iron Mountain and Twin Falls and thence finds its way into the 66,000 volt system or into the 132,000 volt system.

Q. East of the town of Felch on the map appears the line which ultimately runs up to form an interconnection with the Cliffs Power & Light Company. Will you describe that line? A. That line is referred to as the Gwinn Line, inas-

much as the interconnection with the system of Cliffs Power & Light Company is made at a locality named Gwinn.

This line branches from the 66,000 volt line extending between Twin Falls and Cornell. It operates at 66,000 volts and consists of one circuit of number 1/0 copper conductors

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carried on wood poles.

The total length of this line is twenty-eight miles. It was built in 1937 to effect an interconnection between the sys-
3173 tems of Wisconsin Michigan Power Company and Cliffs Power & Light Company.

The interchange between these companies through this interconnection makes it possible for Wisconsin Michigan Power Company to obtain energy from Cliffs Power & Light Company for use in its Michigan distribution system and to also furnish Cliffs Power & Light Company with energy generated in the Michigan plants of Wisconsin Michigan Power Company.

Q. Now, have you described all the transmission lines
3174 located generally in this northern territory? A. Yes, I believe I have described all the transmission lines located in this portion of the company's territory. There may be some short lengths which I haven't singled out individually, but I have covered the principal lines in the transmission system of this part of the company's property.

Q. Now, in that portion of the territory served, centering around Appleton, what transmission lines are there? A. The transmission lines in the southern portion of the territory of Wisconsin Michigan Power Company have a total

length of 211 miles of 33,000 volt line, fifty-six miles of 13,800 volt line, twelve miles of which are carried on steel

—1,480—

towers and the remainder on wood poles.

The principal line in this portion of the system is the one shown on the map beginning at Appleton and extending straight north for a distance, then turning northwesterly and resuming its northward travel to the community of Bonduel. At that point the line turns west and north to Sha-
wano. There it continues westerly and southerly to a point 3176
of interconnection with the system of Wisconsin Power & Light Company near the city of Clintonville, which being outside of the territory served by Wisconsin Michigan Power Company, is not located on the map.

From Clintonville, the line continues southerly to the city of New London where interconnection is made with the municipal distribution system. There it turns east and south through the community of Hortonville, and then turns west again returning to Appleton.

This line forms a complete loop—— 3177

Q. (Interposing) It turns east, I think, to Appleton. A. It turns east to Appleton, yes. This line forms a complete loop which, together with the branch lines reaching from it at the same voltage of 33,000 volts, comprise a total length of 156 miles.

This loop is the backbone of the southern transmission system of the company. It consists of copper conductors of various sizes, ranging from number four to 1/0.

—1,481—

One branch which operates at 13,800 volts, connects the sub-station at Bonduel with Wisconsin Michigan Power Company's hydro-electric plant at Oconto Falls.

Another branch operating at 13,800 volts runs west from the junction near the community called Dale, near Appleton, through Readsfield and Fremont, to Weyauwega hydro-electric plant of the Wisconsin Michigan Power Company.

There is another 33,000 volt loop in this portion of the company's transmission system. This loop extends from
3179 Appleton to the south through the cities of Menasha and Neenah and then returns to Appleton by a more westerly route.

The length of this loop is thirteen miles, about half of which is carried on steel towers. The section that is carried on steel towers has been designed to operate at 66,000 volts.

The towers have the proper conductor spacing for that voltage and the insulators for that voltage are in place, but the line is presently being operated at 33,000 volts.

Another 33,000 volt line in the southern portion of the
3180 company's system is the one extending from Appleton easterly and southerly to the community of Hilbert. This line is thirty-six miles long and consists of five miles of number two copper conductors on steel towers, and thirty-one miles of number two and number four copper conductors on wood poles.

—1,482—

I believe I made a misstatement. I meant to say that five miles of this line consisted of number 2/0 copper conductors on steel towers.

Q. Have you given the capacity of the transmission line running from Twin Falls to Appleton? A. I don't remember that I did, but the normal operating capacity of the line—that is, the load which the line will carry under satisfactory conditions of voltage regulation—is between 25,000 and 30,000 kilowatts on the section between Twin Falls and Appleton.

The section betwen Appleton and Lakeside, likewise, has a capacity of approximately twenty-five or thirty thousand
kilowatts for this length of line alone, but if the two sections, 3182
namely, the one from Lakeside to Appleton, and from Appleton to Twin Falls, are considered in total, a load of between 15,000 and 20,000 kilowatts is about all the line will carry with satisfactory voltage regulation.

The load-carrying capacity of this line can be increased during heavy load conditions by supplying certain quantities of wattless current from the Appleton steam plant, or by maintaining a high power factor at the Milwaukee end by means of leading current from the power plants there, and that is why I have given the carrying capacity of this line
as being about the figures I have given, rather than specific 3183
amounts.

Q. What are the principal transmission sub-stations of

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the Wisconsin Electric Power Company? A. The Wisconsin Electric Power Company has only three sub-stations which are classified as transmission. All three of these are shown on Exhibit 32.

One of them is the sub-station at the Lakeside Power Plant. This sub-station consists of two sections. One sec-

tion raises the voltage from the generator voltage of 13,200 to 26,400 volts. This section has a capacity of 60,000 k. v. a. and is used to step up the voltage of that portion of the output of the Lakeside Plant which is sent out through the 26,400 volt lines emanating from the Lakeside Sub-station.

I described some of those lines this morning. Certain others of them are considered distribution lines inasmuch as they lead from the power plant directly into the city of Milwaukee and serve distribution sub-stations which are scat-
3185 tered all over the city to feed the distribution system.

The other section of the Lakeside Sub-station raises the voltage from 13,200 volts to 132,000 volts. This section has a capacity of 240,000 k. v. a. and performs the function of raising the voltage of that part of the output of the Lakeside Plant which is sent out on the 132,000 volt transmission lines.

As the capacities of the two sections of the sub-station would indicate, the latter section handles the major portion of the output of the plant.

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Another transmission sub-station of Wisconsin Electric
3186 Power Company is the one located at Granville which I mentioned previously in connection with the operation of the transmission lines.

The Granville sub-station operates between the voltages of 26,400 and 132,000. Its principal function is to step down the voltage of 132,000 volt energy which it receives either from the Port Washington Power Plant or from Appleton or from the Lakeside Plant, to 26,400 volts for delivery to either the line of Wisconsin Gas & Electric Company which leads to Menomonee Falls from Granville, or to the numer-

ous 26,400 volt circuits of Wisconsin Electric Power Company which are supplied by the Granville Station.

The third transmission sub-station of Wisconsin Electric Power Company is the one located at the Port Washington power plant. It, likewise, has two sections, one of 20,000 k. v. a. raises the voltage from 22,000 volts to 26,400 volts. 22,000 volts is the voltage at which the generator in the Port Washington plant operates.

The output of this section of the Port Washington Sub-station is delivered to the 26,400 volt lines of the Wisconsin 3188
Electric Power Company and Wisconsin Gas & Electric Company which connect with the stations.

The other section of the Port Washington Sub-station raises the voltage from 22,000 volts to 132,000 volts. This

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section has a capacity of 90,000 k. v. a. and serves to deliver the output of the plant to the 132,000 volt transmission lines which connect with the main transmission system of Wisconsin Electric Power Company.

Q. Those are the three transmission sub-stations. How many distribution sub-stations are there? A. Wisconsin 3189
Electric Power Company has fifty-six distribution sub-stations which has a total combined capacity of 470,147 k. v. a. By the term "distribution sub-station" I mean a sub-station which is used in lowering the voltage of energy from a transmission voltage to a voltage suitable for supply to the distribution system of the company.

Our transmission sub-stations are classified as such because they perform the function of raising the voltage for delivery to a transmission line.

3190 Measured in similar terms, a distribution sub-station is one which transforms energy for delivery to a distribution line.

Now, these fifty-six sub-stations all perform that function. Forty-one of them perform the additional function of converting alternating current energy into direct current energy by means of rotary converters or mercury arc rectifiers, or motor generator sets.

The total capacity of such conversion equipment located
3191 in these forty-one sub-stations is 106,240 k. v. a.

—1,486—

The total transformer capacity of all the sub-stations of Wisconsin Electric Power Company is 970,147 k. v. a.

Q. The sub-stations you have referred to as distribution sub-stations are not shown on Exhibit No. 32? A. Some of them are, but not all of them. In preparing Exhibit 32, we have shown only the sub-stations which are among the larger ones of the company.

The smaller ones have not been indicated because it was felt the map would be made unduly complicated and the
3192 information on it a little too dense for the map to be used conveniently.

If all the sub-stations of Wisconsin Electric Power Company were to be shown, the map would be thoroughly sprinkled with them and I doubt that there would be room within the area of Milwaukee, for instance, to show them all.

Q. What are the principal sub-stations of the Wisconsin Gas & Electric Company? A. The principal sub-stations of Wisconsin Gas & Electric Company are that company's transmission sub-stations, of which there are three.

One is located at Elkhart Lake in the northern portion of the territory served by Wisconsin Gas & Electric Company. This sub-station steps down energy from a voltage of 132,000 volts to 13,200 volts and 4,800 volts.

The transformer bank, delivering energy at 13,200 volts,

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furnishes power to the 13,200 volt transmission line extending from Elkhart Lake to Kiel, and the bank transforming to 4,800 volts serves to supply energy for distribution in this portion of the territory of the Wisconsin Gas & Electric 3194
Company.

Another of the transmission sub-stations of Wisconsin Gas & Electric Company is located in the city of Kenosha. It is known as the Albers Street Sub-station which I mentioned in connection with the operation of the transmission lines. This sub-station has a capacity of 60,000 k. v. a. and transforms energy from a voltage of 132,000 volts to one of 26,400 volts. The function of this sub-station is to receive high voltage power from the lines of Wisconsin Electric Power Company and transform it to a voltage suitable for 3195
delivery to the transmission system of Wisconsin Gas & Electric Company.

The third transmission sub-station of Wisconsin Gas & Electric Company is the one located at Whitewater. This sub-station has a capacity of 10,000 k. v. a. and serves to transform energy from a voltage of 132,000 volts to one of 26,400 volts. It receives high voltage energy from the 132,000 volt transmission system of Wisconsin Electric Power Company and transforms that energy to 26,400 volts for delivery to the three lines of Wisconsin Gas of that

3196

voltage which receive power from the Whitewater sub-station.

In addition to these three transmission sub-stations,

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Wisconsin Gas & Electric Company also has thirty distribution sub-stations. These distribution sub-stations are located at various points in the territory served by the company and the principal ones among them have been indicated in Exhibit 32.

3197 The total capacity of the thirty distribution sub-stations is 51,173 k. v. a.

Q. How many transmission sub-stations does Wisconsin Michigan Power Company have? A. Wisconsin Michigan Power Company has twenty-four transmission sub-stations.

These have a combined capacity of 129,025 k. v. a. Eleven of them are located at the power plants of the company and all of the eleven are shown on the map.

Of those located at the power plants, one is at the Twin Falls Station, one at Quinnesec Falls Plant, one at White Rapids Plant, one at Chalk Hill Plant, one at the Brule
3198 Plant, one at the Sturgeon Plant, one at the Pine River Plant, one at the Appleton Power Plant, one at the Weyauwega hydro-electric plant, and one at the Oconto Falls hydro-electric plant.

The other thirteen transmission sub-stations are located at various points on the transmission system of the company and are all shown on the map.

The total capacity of these twenty-four transmission sub-stations—I have given that—is 129,025 k. v. a.

—1,489—

 3199

The Wisconsin Michigan Power Company also operates thirty-five distribution sub-stations with a total capacity of 17,930 k. v. a. and 49 other distribution sub-stations which have been constructed for individual customers.

They are classified as customers' sub-stations. These 49 have a combined capacity of 34,236 k. v. a.

May I add the Iron River Sub-station to the list of transmission sub-stations located at power plants of the Wisconsin Michigan Power Company?

Q. Iron River Sub-station being the eleventh in that list? 3200
A. Yes.

Q. What is the extent in line miles of the distribution system of the Wisconsin Electric Power Company? A. Would you repeat that question, please?

(Whereupon, the pending question was read.)

The Witness: Wisconsin Electric Power Company operates a distribution system comprising 2,738 miles of pole line and 173 miles of underground line.

These lengths of line are as of December 31, 1939. 3201
At that date, the system of Wisconsin Electric Power Company was serving 250,770 customers through 273,995 electric service meters.

The distribution system includes 17,511 line transformers having a combined capacity of 268,795 k. v. a.

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This extensive system has been carefully designed and constructed so as to maintain high quality of service at minimum investment and operating expense.

3202

The policy of the management with respect to distribution functions, as well as other functions, has been to improve the system and the operating practices as much as would be consistent with good economy and good service.

A number of years ago a program directed toward the limitation of 250-volt direct current service was undertaken. This class of service was the first electric service to be rendered to the public in Milwaukee
3203 and has been continued down to the present time.

Some of that service is still being rendered.

Because of the greater expense of operating the 250-volt direct current system, a decision to minimize the service with the idea of eventually eliminating it entirely, has been carried out.

The direct current area served by Wisconsin Electric Power Company covers a space of between one and two square miles in the center of the downtown district of the city of Milwaukee. The outlines of the area are not definite because there are certain streets
3204 in which the direct current cables were laid in the streets years ago and are still in service while subsequently alternating current lines have been erected on poles in the alleys.

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In many of those instances, one customer will take direct current service and his next door neighbor will take alternating current service.

Then, another reason why the outline of the direct current area is not definite is because of the program

which the company is engaged in to minimize that type of service, direct or alternating current customers are located practically all the way through the direct current area. They are being served from a low-voltage network which has been in operation for several years and is being enlarged as rapidly as the increasing demands on it will justify.

It is the policy of Wisconsin Electric Power Company to not add any new customers to the direct current system unless there are technical reasons why 3206
the customer must have that service.

If it is possible to serve him reasonably from the alternating current system, he will not be given the direct current.

Likewise, any present customers who are now taking direct current service and who wish to expand their consumption, are urged by the company to make their expansion in such a way as to utilize alternating current for the additional load.

I stated this morning that the program has been under way for some years for a reduction and even- 3207
tual elimination of 25-cycle service on the system of the Wisconsin Electric Power Company.

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That has been carried to the point where we now no longer purchase 25-cycle power from Wisconsin Power & Light Company and the only 25-cycle energy that is now used on the system is that delivered to a few industrial 25-cycle customers and a small amount which is used in converters which convert the 25-cycle energy for railway use.

The original use for the 25-cycle energy which was purchased from the Wisconsin Power & Light Company was that of conversion for railway consumption.

As a result of that, a number of the railway substations which are still in operation are equipped to receive 25-cycle energy and inasmuch as the management hasn't felt that it is the time to change over all those 25-cycle sub-stations, it is necessary to continue some 25-cycle generation on the system for those sub-
3209 stations as well as for the few 25-cycle customers that we still have.

The reduction in the use of 25-cycle service has made it possible to take out of service those engine-driven 25-cycle generators at the Commerce Plant and has also made it possible to change over three of the manually operated 25-cycle railway sub-stations to automatic 60-cycle rotary converter installations.

Appreciable economies have been realized by making these changes. Such economies are quite evident from the reduction in the number of pieces of equip-
3210 —1,493—
ment that have to be operated, the number of circuits that have to be provided and maintained, and the amount of different kinds of reserve capacity which must be held in readiness to furnish continuous service to any of these various classes.

That is, service to 25-cycle customers must be validated by 25-cycle reserve capacity.

The same holds true with respect to 250 volt direct current service. A number of separate circuits

have also been eliminated through this standardization of service and we have come to feel that this program for standardizing on 60-cycle service has been in a way, if you please, an integration of class of service.

That is, we have concentrated on one type and are looking forward to the time when that will be not only the predominating type of service on the system, but the only one.

Q. What is the extent in line miles of the distribution system of the Wisconsin Gas & Electric Company? A. Wisconsin Gas & Electric Company operates a distribution system including 4,740 miles of pole line and 31 miles of underground line. This system serves directly 65,724 customers. 3212

Q. And your figures, again, are at December 31, 1939? A. Yes, they are.

In serving these customers, the company makes use of

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72,426 electric service meters and 18,249 line transformers which have a total capacity of 107,727 k. v. a.

The distribution lines of Wisconsin Gas & Electric Company form a close network within the areas through which its transmission lines pass. 3213

The sub-stations have been located so as to serve the greatest area that could be served economically from given locations, the purpose being economy of construction and simplicity of operation.

Q. None of these distribution lines are shown on Exhibit No. 32? A. No, none of the distribution lines of Wisconsin Gas & Electric Company are shown.

3214 *Edward H. Schmidtman—By Respondents—Direct*

Q. Or of Wisconsin Electric Power Company? A. Some of the lines shown for Wisconsin Electric Power Company are classified as distribution. They have been shown on the map, as I pointed out previously, in order to indicate the routes by which service is taken to the various communities shown.

Some of the smaller communities are served by lines which, for accounting purposes, have been classified as distribution lines.

3215 Inasmuch as we did not prepare a distribution line map of the systems we felt it desirable to indicate on here those distribution lines which reach communities that are served

—1,495—

within the territory.

A distribution line map drawn on the scale of Exhibit 32 would be almost physically impossible to prepare, because of the closeness of the lines to each other.

The area shown to indicate the city limits of the city of Milwaukee would be colored solid black. The lines would touch each other, and in the area served by Wisconsin Gas

3216 & Electric Company in many instances there are as many as a dozen lines traveling in parallel directions within a mile. You can see from that, that with a scale of ten miles to an inch, the lines would be closer together in some places than the cross-hatching on the map.

Q. Will you give the comparable data on the distribution system of the Wisconsin Michigan Power Company? A. The distribution system of the Wisconsin Michigan Power Company includes 3,112 miles of overhead pole lines. None of the distribution lines of Wisconsin Michigan Power Company are carried in underground conduit.

The system serves 36,297 customers through 40,129 electric service meters.

Here, again, the data on length of line, number of transformers, and number of meters applies to the end of the year 1939.

Q. And electric customers, also? A. And electric customers, yes.

—1,496—

The distribution system of Wisconsin Michigan Power Company has been expanded and its capacity increased as 3218
the loads have grown in the communities in the territory served. A number of small electric systems were acquired by the company and merged in 1927.

For the most part, those systems consisted of lines in very poor state of repair, constructed according to very low construction standards, and had to be completely revamped in order to meet the company's service requirements.

In many instances, the entire systems were replaced from end to end. Poles and wire transformers, and especially in the case of street lighting equipment, where many of the units were the old-fashioned tin-plate reflectors with bare 3219
electric bulbs, complete replacements were made by the company.

The same situation applies to the small systems acquired from time to time by Wisconsin Electric Power Company and Wisconsin Gas & Electric Company, and after the acquisitions had been made and the systems revamped to meet the construction standards and service standards of the companies, the quality of service was materially improved

and the volume of service taken by the customers showed material growth.

Wisconsin Michigan Power Company has also carried on a vigorous rural electrification program which has resulted in the construction of many miles of rural distribution lines.

These rural lines reach into all portions of the electric

—1,497—

service area of the company except some of the unsettled
3221 sections in the upper pensinsula of Michigan where there are extensive areas of logged-over forest land with few or no inhabitants.

The remarks I made about the vigorous rural electrification program of Wisconsin Michigan Power Company applies with equal force to Wisconsin Electric Power Company and Wisconsin Gas & Electric Company.

In the case of the latter company, particularly, an active program for increasing the use of electricity by rural customers has been carried out over a period of years and the use of the service in the territories of Wisconsin Gas &
3222 Electric Company and Wisconsin Electric Power Company is among the highest in the state of Wisconsin, and likewise among the highest in comparable areas in the United States.

Q. What is the book value of the gas utility property of the Wisconsin Gas & Electric Company? A. As of December 31, 1939, the book value of the gas plant in service of Wisconsin Gas & Electric Company was $11,819,234.00.

Q. That figure is before depreciation, is it? A. Yes, that figure is before depreciation.

Q. Will you describe very briefly the gas production equipment or plants operated by Wisconsin Gas & Electric Company? A. Wisconsin Gas & Electric Company oper-

—1,498—

ates gas plants at three different locations.

There are two plants in the city of Racine, one of which produces coke oven gas and has a rated capacity of 8,500 m. c. f. gas per day, and the other of which produces water gas and has a rated capacity of 2,225 m. c. f. per day.

The two other plants of Wisconsin Gas & Electric Company are located in the cities of Waukesha and Fort Atkinson. They are both water gas sets, the one at Waukesha having a rated capacity of 800 m. c. f. per day and the one at Fort Atkinson having a rating of 250 m. c. f. per day. 3224

The Waukesha and Fort Atkinson Plants and the Racine water gas plant are not in regular operation.

The coke oven gas plant at Racine produces the gas which is transmitted and distributed over the gas system of Wisconsin Gas & Electric Company.

Q. Will you locate the gas holders owned by Wisconsin Gas & Electric Company? A. Wisconsin Gas & Electric 3225 Company owns twelve gas holders whose location is shown on Exhibit 32. One is at Racine, and is designated by the open square containing the diagonal cross. This one—or rather I should say there are four holders at Racine, all designated by this one symbol.

These four holders have a combined storage capacity of 4,550 m. c. f.

—1,499—

At Kenosha there is another gas holder with a capacity of 1,000 m. c. f. It is also shown on the map.

The gas holder shown at Fort Atkinson, or rather, the symbol shown at Fort Atkinson, represents two small gas holders with a combined storage capacity of 130 m. c. f.

The symbol at the city of Watertown represents two holders also with a combined capacity of 190 mcf.

The gas holder symbol shown at Waukesha designates three individual holders with a composite capacity of 650 m. c. f. These gas holders are used regularly in the operation of the company's gas transmission and distribution system.

3227 The ones at Racine, of course, are used to store the gas immediately upon its manufacture. Those at the other points on the system are used as equalizers to carry the local gas consumption peaks on the various portions of the system during the day.

Q. There appear then, to be five locations and a total of twelve holders in the system? A. Yes, that is right. There are a total of twelve holders in the system located at five different points within the gas service territory.

Q. Will you state the number of miles of gas transmission mains operated by the Wisconsin Gas & Electric Company?

3228 A. Wisconsin Gas & Electric Company operates a gas trans-

—1,500—

mission system comprising 280 miles of high-pressure transmission mains.

The location of these mains is shown in Exhibit 32 by the dashed line colored in yellow. 16.7 miles of these mains are three inches in diameter. 114.5 miles are four inches in diameter. 94.6 miles are six inches in diameter. 40.4 miles are eight inches in diameter, and 13.8 miles are ten inches in diameter.

This gas transmission system utilizes in its operation six gas pumping stations located at various points on the system. These pumping stations have a combined capacity of 600 m. c. f. of gas per hour. They are necessary in the operation of the system in order to maintain the pressure in the lines and to offset the loss of pressure resulting from friction due to the flow of the gas through the pipes.

The high-pressure mains for the most part are laid underground along highways or along railroad lines, and they come over the ground only where the lines cross deep ravines 3230 or some other obstruction of that kind that makes it simpler to come overground than stay underground.

For a considerable portion of the distance between Racine and Milwaukee, the high-pressure gas transmission line of the Wisconsin Gas & Electric Company is laid inside the electric interurban right-of-way of the Milwaukee Railway and Transport Company by putting the line in that right-of-way and paying a rental based upon the cost of the right-

—1,501—

of-way, the Wisconsin Gas & Electric Company was able 3231 to effect a considerable saving in right-of-way costs along that section of the line because that is a relatively heavily settled district and the people in that area are quite land conscious or right-of-way conscious, and rights-of-way in there are extremely expensive.

The Examiner: Let us have a little recess.

(Whereupon a short recess was taken.)

—1,502—

The Examiner: You may proceed.

By Mr. Hamilton:

Q. Had you finished your description of gas transmission lines? A. Yes, I have.

Q. Will you state the extent of the gas distribution mains operated by Wisconsin Gas & Electric Company? A. The gas distribution system of Wisconsin Gas & Electric Company includes both low pressure mains and high pressure mains. Of low pressure, cast-iron mains, ranging in size from three inches to thirty inches diameter, the system
3233 includes 1,537,299 feet.

Other low pressure mains made of wrought iron or steel and varying in diameter from one inch to sixteen inches comprise a total length of 325,638 feet.

The high pressure mains, all of which are steel pipe, ranging in size from ¾ inch to 4 inches constitute a total length of 1,358,961 feet.

This latter class of high pressure mains are those indicated—correction—the total combined length of all distribution mains is a trifle over 610 miles.

3234 Q. Now, can you state the number of services which the Company furnishes? A. The gas distribution system of Wisconsin Gas & Electric Company, in addition to the mains by which it distributes the gas, also includes 58,174 service

—1,503-1,504—

connections. A gas service connection is the length of pipe which runs from the gas main in the street to the property, for the purpose of delivering gas to the individual customers premises.

Of the total number of services in the gas distribution system of Wisconsin Gas & Electric Company, 49,393 are

in active use and extend all the way from the main to the customer's meter.

8,781 of the services of the Company extend only from the main to the curb and are held for future use. These curb services are installed at the time the mains are laid, because it is more economical to install them at that time, when the men and equipment are on the job, than it is to leave them until later, when the installation of a service from the main to the curb might involve digging up the pavement.

The average number of customers served during the year 3236
1939, by the gas distribution system of Wisconsin Gas & Electric Company, was 50,774. Of these, 47,696 were residential customers, using gas for cooking and water heating. 185 of them were residential customers using gas for space heating. 2,765 were commercial customers using gas for purposes other than space heating—largely for cooking and water heating—and 30 were commercial customers using gas for heating purposes.

—1,505—

98 of the total were customers making use of gas for industrial purposes. 3237

These customers were served through a total of 51,702 gas service meters, of which 51,659 are regular meters and 43 are prepayment meters—the type in which the customer must deposit a coin before he can take any gas.

Q. What is the book value of the gas utility property of Wisconsin Michigan Power Company? A. The book value, before depreciation, of the gas utility plant in service of Wisconsin Michigan Power Company, as of December 31, 1939, was $2,373,255.00.

Q. And its production equipment? A. This gas utility plant includes production equipment which consists of a gas plant located in the city of Appleton.

The plant has a total capacity of 1,860 M. C. F. per day, of which 900 M. C. F. per day capacity is from coal gas, and 960 M. C. F. is from a water gas set.

Q. And its holder capacity? A. Wisconsin Michigan Power Company also has four gas holders, three of them located at the location of the Appleton gas production plant,
3239 with a storage capacity of 651 M. C. F., and one located in the city of Neenah, having a capacity of 200 M. C. F.

The gas production equipment at Appleton and the gas

—1,506—

holder at Neenah are connected by means of a high pressure wrought iron transmission main.

The total length of this main is 6.4 miles, of which one mile has a diameter of four inches, and 5.4 miles has a diameter of six inches.

Q. And the Company's distribution mains are how extensive? A. The low pressure distribution mains of Wiscon-
3240 sin Michigan Power Company vary in size from below one inch to 16 inches in diameter. These have a total length of 531,899 feet.

The high pressure mains, varying in size from one inch or less to eight inches, have a total length of 104,973 feet. The total length of all distribution mains, both high pressure and low pressure, in the gas distribution system of Wisconsin Michigan Power Company, is nearly 121 miles.

Q. And again, if you will, the number of services which the Company maintains? A. There are a total of 10,595 gas

services connected to the gas distribution mains of Wisconsin Michigan Power Company.

Of these, 10,310 are in active use and 285 are main-to-curb services held for future use.

These services deliver gas to customers who, during the year 1935, averaged 9,234 in number.

—1,507—

Q. 1939? A. 1939 is correct.

The residential consumers constituted 8,742 of this number, the commercial consumers 463, and the industrial con- 3242
sumers 29.

These 9,234 gas customers were served through 9,257 gas service meters.

Q. Turning, now, very briefly, to the heating business furnished by Wisconsin Electric Power Company, can you state the book value of this plant in service devoted to the heating business? A. The book value of the plant in service of Wisconsin Electric Power Company, devoted to the steam heating business, as of December 31, 1939, was $2,996,436.00 before depreciation. This figure includes the book value of
the property used entirely in the heating business, as well 3243
as in apportionment of the book value of the power plants which generate steam for heating purposes, as well as producing electricity for distribution.

The distribution mains—steam distribution mains—of Wisconsin Electric Power Company have a combined length of 111,857 feet, and they serve a total of 984 steam heating customers.

Of these customers 32 are residential and 952 are commercial.

—1,508—

The figures I have just given on length of mains and number of customers apply to the end of 1939.

Q. Will you give comparable data for the steam heating business of Wisconsin Gas & Electric Company? A. Wisconsin Gas & Electric Company operates a small steam heating business in the city of Waukesha. The book value of the heating plant in service as of the end of 1939, again including apportionment of power plant investment allocated to the generation of steam for heating operations, was $193,
3245 935.00.

The distribution mains in Waukesha, at that same date, had a total length of 7,115 feet and served a total of 204 customers, of whom 40 were residential and 164 were commercial.

Q. The heating business is confined to Waukesha, is it? A. Yes, it is.

Q. In their operations, are the generating and transmission systems of the three companies coordinated? By "three companies", I mean Wisconsin Electric Power Company, Wisconsin Gas & Electric Company, Wisconsin Michigan
3246 Power Company. A. Yes. The operations of the power production and transmission facilities of all three companies are well coordinated.

—1,509—

The plants of each company are operated on a somewhat divisional basis. That is, they are operated primarily in meeting loads of the systems served by the respective company's plants, and further than that, whenever there is a possibility of coordinating the operations of the plants of one company with the operations of the plants of the other, ad-

vantage is taken of those opportunities in order to give the most effective over-all operation of the entire system.

Q. Have you data as to the percentages of kilowatt hours generated, taking the statistics of the three companies together? A. Yes, I have. In the year 1939 the power generation facilities of the three companies of the Wisconsin Michigan group produced a net output of 1,504,874,726 kilowatt hours.

Of that total, generation in the steam power plants of Wisconsin Electric Power Company contributed 1,277,278,- 3248
698 kilowatt hours, or 84.9 per cent. of the total for the three companies.

The plants of Wisconsin Gas & Electric Company delivered a net output of 1,241,584 kilowatt hours, or slightly less than one-tenth of one per cent. of the total.

The plants of Wisconsin Michigan Power Company produced 226,354,444 kilowatt hours of net generation, which was 15 per cent. of the combined total.

—1,510—

The generation which I have just given for the plants of Wisconsin Electric Power Company was all produced by 3249
steam. That generated by the plants of Wisconsin Gas & Electric Company is entirely hydro-electric generation, produced in the three hydro-electric plants of that company.

The net output of Wisconsin Michigan Power Company is made up of three types of generation. The steam plants of that company delivered a net output of 15,342,445 kilowatt hours.

The hydro-electric plants of Wisconsin Michigan Power Company generated 210,977,404 kilowatt hours net, and the

Iron River diesel engine plant produced a net output of 34,595 kilowatt hours.

Q. On the combined generating systems, which plant carries the base load? A. The base load of the combined three company system is carried by the Port Washington plant of Wisconsin Electric Power Company.

This plant is the most efficient steam plant serving the combined system, and, because of that fact, is assigned the duty of carrying the base or continuous portion of the loads
3251 on the system.

The Port Washington plant, as I have previously explained, is rated at 80,000 kilowatts, but it operates most efficiently at a load of 64,000 kilowatts.

—1,511—

For that reason it is operated steadily, whenever the loads on the systems will permit, at a demand of very close to 64,000 kilowatts.

Q. In the operation of this combined generating system what is the function of the Commerce Street and East Wells Street plant of the Wisconsin Electric Power Company? A.
3252 The Commerce Street and East Wells Street plants carry a portion of the loads on the electrical system of the companies, which is determined very largely by the requirements for steam for the heating system.

Their output is relatively small—or, rather, it has been, in the past—and has been largely limited to those months of the year in which steam is required for distribution in the downtown heating system.

With the new units going into service, however—that is, the new boiler plant and generating unit at East Wells

Street, and a somewhat similar installation at Commerce Street—these stations will be used to carry increasing amounts of the electrical load in the future, inasmuch as they will be equipped to exhaust into condensers and will be able to generate electrical power beyond that which is limited by the requirements for heating steam.

The Port Washington plant carries the base load. The Commerce Street and East Wells Street plants carry electrical load according to the heating load.

—1,512— 3254

The Racine plant, as I have explained, is not in regular operation but is started periodically and operated under load to make sure it is in operating condition.

Now, after those plants have made their contribution to the power requirements of the system, the Lakeside plant is used to carry the rest of the system demands, speaking now of the system of Wisconsin Electric Power Company.

At the same time the small generation of the hydro-electric plants of Wisconsin Gas & Electric Company is delivered into the system.

Under this arrangement of operations it can be seen that 3255
the load carried by the Lakeside plant is the most variable part of the load on the entire system, and because of those variations the Lakeside plant suffers the loss of economy that always accompanies the picking up and dropping off of loads on steam-driven units.

The Lakeside plant, because of its greater capacity, and because of the large number of units installed there, is best able of all the plants of the Company to carry these fluctuating loads.

Units in the plant range in size from 20,000 to 60,000 kilowatts. The 7,700 kilowatt units are not used individually without using the 60,000 kilowatt units with them.

To the greatest possible extent the loads on the Lakeside plant are carried on the high pressure equipment, because

—1,513—

of its greater efficiency, and the low pressure units are utilized only when the load on the plant goes to a point beyond the capacity of the high pressure units.

3257 The total generation in the power plants of Wisconsin Electric Power Company in 1939, under this general program of operation, was divided as follows:

Lakeside plant, 840,813,115 kilowatt hours.
Port Washington plant, 391,411,055 kilowatt hours.
East Wells Street plant, 34,471,800 kilowatt hours.
Commerce Street plant, 9,831,053 kilowatt hours.
Racine plant, 751,675 kilowatt hours.

Making the total net generation, which I have previously
3258 given for Wisconsin Electric Power Company.

Q. I think you indicated sufficiently the fact that Wisconsin Gas & Electric Company does practically no generation of its own. Could you give the figures on net kilowatt hour output of whatever generating capacity is operated by that company? A. Yes, I can. The net output of the three hydro-electric plants of Wisconsin Gas & Electric Company in 1939 was 1,241,584 kilowatt hours.

In terms of the total energy requirements of 207,451,690 kilowatt hours, of the system of Wisconsin Gas & Electric

 3259

Company in that year, this generation constituted about six tenths of one per cent.

—1,514—

Q. Within the generating units of Wisconsin Michigan Power Company what principles are followed in distribution of the operating generating capacity? A. The principal rule that is followed by the operators of Wisconsin Michigan Power Company in connection with power generation and transmission is to make the power plants of that company
serve the entire needs of the system as completely as pos- 3260
sible and to obtain from those hydro-electric plants as much output as can possibly be obtained with the quantities of water that are available under existing conditions.

The output of the hydro-electric plants of Wisconsin Michigan Power Company is supplemented by generation at the Appleton steam plant of that company and also by a very small amount of generation at the Iron River diesel plant.

Under the water conditions obtaining in 1939 and the
load conditions on the system, the hydro-electric plants of 3261
that company generated a total net output of 210,977,404 kilowatt hours.

The Appleton steam plant produced 15,342,445 kilowatt hours, and the Iron River internal combustion plant produced 34,595 kilowatt hours.

The plants in the northern portion of the Company's system are operated so as to make that section of the system as nearly self-supporting as possible, with respect to power supply.

—1,515—

Such operation eliminates unnecessary transmission of large quantities of power over the line from Appleton to the north, and consequently keeps transmission losses at a minimum.

During the seasons of high water, as I have pointed out, these plants produce more energy than the local market requires, and the surplus is sent south over the high voltage transmission line.

During seasons of low run-off the reverse is true—that
3263 is, the shortage of power in the northern division is made up by steam power sent north from Appleton, or by power generated at the two hydro-electric plants in the Appleton division.

Q. You have indicated a number of points at which interconnections exist between the transmission systems of Wisconsin Electric Power Company and the Wisconsin Gas & Electric Company.

In the actual operations of the two systems, are the transmission systems of the two companies closely coordinated and closely connected in operation? A. Yes, they are
3264 so closely connected and so closely coordinated as to operation that, in an operating sense, they are only one system.

I have pointed out at how many points the two systems are interconnected, and, in many instances, those interconnections are nothing more than a change in ownership of line.

—1,516—

Wisconsin Electric Power Company normally delivers to the system of Wisconsin Gas & Electric Company monthly quantities of energy ranging up to 16 or 17 million kilowatt hours.

These deliveries are made at 28 different locations and quantities of the energy, delivered to Wisconsin Gas & Electric Company through these 28 points of contact, are returned in part to the system of Wisconsin Electric Power Company at more than twenty different points.

Nine of the points at which delivery is made to Wisconsin Gas & Electric Company are also points at which energy is returned to the system of Wisconsin Electric Power Company from that of Wisconsin Gas & Electric Company.

Now, this flow and reflow of energy between the two sys- 3266
tems is the sort of thing that one would find if he undertook to set out any portion of any one system and trace the flow of energy into and out of that section.

The energy returned to the system of Wisconsin Electric Power Company from that of Wisconsin Gas & Electric Company consists of a part of the same energy which was previously delivered to the system of Wisconsin Gas & Electric Company at some other point,—that is, at any one instant, when energy is flowing back into the system of Wisconsin Electric Power Company, it is also flowing into the system of

—1,517— 3267

Wisconsin Gas & Electric Company somewhere else.

Except for the small generation in the hydro-electric plants at Watertown and West Bend, the energy furnished by Wisconsin Electric Power Company is the only energy that Wisconsin Gas & Electric Company has, so, in billing Wisconsin Gas & Electric Company for the energy delivered to it, Wisconsin Electric Power Company summarizes the deliveries at those 28 different locations, and the number of those points changes from time to time as the systems are

extended and changed, and also summarizes the energy returned at those twenty-odd different locations, determines the net amount delivered to Wisconsin Gas & Electric Company, and bills that amount.

Now, the interchange of energy back and forth between these two systems suggests that not only are the facilities of Wisconsin Electric Power Company used in taking energy to Wisconsin Gas & Electric Company, but likewise that the facilities of Wisconsin Gas & Electric Company are used
3269 in carrying that energy to some other point and returning it to Wisconsin Electric Power Company.

I have made a rather—well, shall we say—offhand inspection of the transmission lines of the two companies and have determined a number of sections of line of Wisconsin Gas & Electric Company which are used at some time or other in carrying energy from the system of Wisconsin Electric Power Company and back to it.

—1,518—

To that extent, Wisconsin Electric Power Company is
3270 actually utilizing the facilities of Wisconsin Gas & Electric Company in serving its own load.

Q. Transmission facilities? A. Transmission facilities, yes.

Q. Can you illustrate that—— A. (Interposing) Yes, I can.

Q. (Continuing) ——interflow of energy? A. Yes. According to the monthly billings which are made to Wisconsin Gas & Electric Company, it is a very common thing for that Company to deliver back to Wisconsin Electric Power Com-

pany certain quantities of electrical energy at the Burlington sub-station, which appears on Exhibit 32.

The energy which is delivered to Wisconsin Electric Power Company at that point must come from either Kenosha or Whitewater, because Wisconsin Gas & Electric Company has no other power sources serving the Burlington sub-station.

That means that the line of Wisconsin Gas & Electric Company between Kenosha and Burlington, and the line be-
tween Whitewater and Burlington, are both at some time or 3272
other being used in transmitting energy of Wisconsin Electric Power Company to the Burlington sub-station.

The Examiner: Well, it could conceivably come, in case you need it, from your interconnection to the

—1,519—

south there—from the Wisconsin Power & Light Company—could it not?

The Witness: No, sir. It couldn't. Because the
interconnections there—— You refer to the ones in 3273
Walworth County?

The Examiner: That is right.

The Witness: Those interconnections are points at which delivery only is made.

Wisconsin Power & Light Company has no power source in what they call their Lake Geneva division in this district in Walworth County, and they rely largely upon the system of Wisconsin Gas & Electric Company to furnish the power for that section.

The Examiner: I see. It is an outgoing interconnection—not an incoming?

The Witness: That is right.

The Examiner: So far as your system is concerned?

The Witness: That is correct. That is entirely the case.

Now, your question indicates to me that I haven't made entirely clear just how it happens that this energy flows back into the system of Wisconsin Elec-
3275 tric Power Company. It isn't because Wisconsin Electric Power Company needs the energy, as your comment indicates might have been the case, but it simply comes about as a result of voltage conditions

—1,520—

on the systems.

You might consider, for purposes of analogy, that the system pictured on the map is built up of pipe lines carrying water, and that water is pumped into it at the points where the power plants are located, and that there are outlets at the sub-stations—
3276 faucets, through which it may be drawn off.

Now, if there is a higher pressure in the line at Whitewater than there is at Burlington, water will flow from Whitewater to Burlington to relieve that inequality of pressure.

The same thing applies with respect to voltage on the lines. If there should be a load in the vicinity of the Burlington sub-station, which lowers the voltage at that point sufficiently, energy will flow to that point from some other source of energy where the voltage is higher.

The Examiner: And similarly, suppose that there should be some cause, or, for some cause or other, some substantial outage at one of your generating plants of Wisconsin Electric Power Company, would energy immediately start to flowing south from the Wisconsin Michigan generating plants?

A. It might and it might not. Under ordinary circumstances power does not flow south into the system of Wisconsin Electric Power Company from that of Wisconsin Michigan 3278
Power Company.

The Examiner: Is it connected up so it could, in case of any emergency that required extra energy?

—1,521—

The Witness: Yes, it is connected up so that it could, but what I was going to say was that the power sources on the system of Wisconsin Electric Power Company are so much greater than those on the system of Wisconsin Michigan Power Company that we consider the interconnection between the two with respect
to emergency service as being more for their benefit 3279
than for ours.

The Examiner: Flow the other way——

The Witness: (Interposing) Yes.

The Examiner: (Continuing)—as a practical proposition?

The Witness: Yes, that is right. But the interconnection through between the companies is a complete and continuous one.

The Examiner: Excuse me, Mr. Hamilton.

By Mr. Hamilton:

Q. Can you illustrate the extent of that flow and reversal of current by reference to data of a specific recent month? A. Yes, I can. I don't have with me the latest billing that has been made between the two companies, but I do have the one for the month of May 1940, which may be considered a representative month.

In that month, Wisconsin Electric Power Company delivered to Wisconsin Gas & Electric Company a total of

3281 —1,522—

17,156,399 kilowatt hours of electrical energy.

Wisconsin Gas & Electric Company returned to the system of Wisconsin Electric Power Company 751,105 kilowatt hours of that energy.

Q. And the billing, as a result of those transactions would be a net billing? A. Yes, a net billing for 16,405,294 kilowatt hours.

Q. Less the amount of current returned? A. That is the net figure.

3282 Q. I see. You have already made the subtraction? A. Yes. Likewise the billing covers demands imposed upon the system of Wisconsin Electric Power Company and recognizes the demands represented by the energy delivered back to that system, so that the billing to Wisconsin Gas & Electric Company covers net demands as well as net energy.

There are a number of other points—or, rather, sections—on the system of Wisconsin Gas & Electric Company, which transmit energy and return it to the system of Wisconsin Electric Power Company.

To run over them rather briefly, energy returned to Wisconsin Electric Power Company at Cedar Grove substation is delivered to Wisconsin Gas & Electric Company at Port Washington.

Energy received from Wisconsin Gas & Electric Company

—1,523—

at Brown Deer is delivered to Wisconsin Gas & Electric Company at the point where that company's line enters the territory of Wisconsin Electric Power Company.

Likewise, energy received from Wisconsin Gas & Electric Company at the latter point is delivered to that company at Brown Deer. 3284

The flow occurs on that line in both directions. The net result in any one month, of course, being in only one direction.

Energy is received from the system of Wisconsin Gas & Electric Company at North Lake, which is located in the northwesterly part of Waukesha County.

In the vicinity of North Lake it is also received from the system of Wisconsin Gas & Electric Company at two points not designated on the map, where two sand and gravel companies take service. 3285

The energy received at those three points from Wisconsin Gas & Electric Company is delivered to that company over at the Granville substation, and the Wisconsin Gas & Electric Company line from Granville over to the vicinity of Merton, where the line changes ownership, is utilized in serving the customers of Wisconsin Electric Power Company in the vicinity of North Lake substation.

Energy is received from Wisconsin Gas & Electric Company at the Belgium substation located near the shore of

Lake Michigan, north of Port Washington, and also at an-
—1,524—
other railway sub-station south of Belgium, which takes service from the same line of Wisconsin Gas & Electric Company.

That energy is delivered to Wisconsin Gas & Electric Company at Port Washington.

Energy which is delivered to Wisconsin Gas & Electric Company at Kenosha is sometimes returned in part at Racine, utilizing the line lying between those cities.

3287 Likewise, power delivered to Wisconsin Gas & Electric Company at the Whitewater substation is returned in part to Wisconsin Electric Power Company up at Watertown on the other side of Jefferson County.

That delivery of energy takes place over one or both of the circuits of Wisconsin Gas & Electric Company, connecting Whitewater and Watertown.

In addition to these sections of line which I have described there are nine points on the distribution system of Wisconsin Gas & Electric Company where customers of Wisconsin Electric Power Company receive service. They
3288 receive that service directly from the lines of Wisconsin Gas & Electric Company, but, inasmuch as they lie within the territory of Wisconsin Electric Power Company, they are considered as customers of the latter company, and the energy delivered to them is a return of energy previously delivered to Wisconsin Gas & Electric Company.

—1,525—

Q. And will you state those points? A. I beg your pardon?

(Last question read by the reporter.)

The Examiner: Can you state those points?

The Witness: The designations I will give refer to certain roads and townships not named on Exhibit No. 32. One of them is at the Mill Road in Milwaukee County; one is in the township of Milwaukee, one is in the township of Merton; one in the township of Brookfield; one in the township of Pewaukee; one in the township of Troy in Walworth County; one in the township of Merton; one in the township of Oconomowoc; and one is located at the switching sta- 3290
tion of Wisconsin Electric Power Company at Saukville east of Port Washington.

These points are fairly well scattered over the vicinity through which the boundary line between the territories of the two companies pass.

By Mr. Hamilton:

Q. Can you state the demand which the requirements of Wisconsin Gas & Electric Company place upon the generating capacity of Wisconsin Electric Power Company? A. The 3291
demands placed upon the system of Wisconsin Electric Power Company, in serving the power needs of Wisconsin Gas & Electric Company, vary from month to month, but in the month of May 1940, for which I have here the billing

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data, the gross demand delivered by Wisconsin Electric Power Company was 44,664 kilowatts.

The demand represented by energy returned to the system of Wisconsin Electric Power Company amount to 684 kilowatts, leaving a net billed demand of 43,970 kilowatts.

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I would like to add at this point that the interflow of energy between the systems of these two companies occurs as a result of load variations on different parts of the combined system.

The flow is not restricted. No attempt is made to control it at any one or any other point, and no distinction is made between the requirements of Wisconsin Gas & Electric Company and the requirements of Wisconsin Electric Power Company in deciding how to operate the transmission sys-
3293 tem. The customers of one company are regarded as being just as important as the customers of the other company.

What I am trying to bring out is that we make no distinction as to whether generation is going to the system of Wisconsin Gas & Electric Company or whether it is going to the system of Wisconsin Electric Power Company. The two, in fact, are one system.

Q. And, necessarily, any load forecasting is based on taking into account the requirements of Wisconsin Gas & Electric Company? A. Yes. Any load forecasting that is made, any analyses relating to available capacity or capac-
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ity requirements, or quantities of energy estimated for budget purposes, or any other purposes, includes the requirements of the customers of Wisconsin Gas & Electric Company on an equal basis with that of the customers of Wisconsin Electric Power Company.

Further than that, load forecasting is usually carried out on a composite system basis, also taking into consideration the power generation facilities and power requirements of the system of Wisconsin Michigan Power Company.

The power production and transmission systems of these companies are considered as a unit with respect to power production and power transmission.

We regard this as just one power pool into which all companies contribute their generation and from which they all draw their requirements.

It is still true, however, as I stated before, that good operation requires that certain sections of the system serve themselves as fully as they can, but, so far as the operations of one section of the system or one company's property may 3296
affect another section of the system or another company's property, the operations and welfare of the combined group is what controls.

The Examiner: I think we made it clear that there is no incoming energy to your system on the south. Now, how about on the north here, where Cliffs

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Power & Light Company interconnects? Is there incoming energy at those connections.

The Witness: Yes, sir. There is. At the point east 3297
of Manistique, Michigan, the line shown on Exhibit 32 extending from Cooks over to the interconnection with Cliffs Power & Light Company, energy is received from that company. All of the energy distributed on that line, and on a lower voltage line extending from Cooks south, is purchased from Cliffs Power & Light Company.

Wisconsin Michigan Power Company has no generating facilities on that section of line.

The Examiner: I recall you stated that in a previous part of your examination.

The Witness: Yes, sir. I did.

The Examiner: It is disconnected from your system?

The Witness: Yes, sir. And the same is true of the isolated line in Marquette County, terminating on the west at Michigamme.

The Examiner: Well, with those two exceptions,
3299 the three companies develop all of the energy that they distribute?

Mr. Hamilton: I think the witness has indicated one or two other points where, in Wisconsin Michigan territory, for example, I believe there are purchases from Kimberley-Clark at certain times.

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The Examiner: That is true.

By Mr. Hamilton:

Q. In order to make your point clear, Mr. Schmidtman,
3300 may I ask you about the point of interconnection in Rock County? I don't know that you specifically mentioned that —interconnection at that point with the system of Wisconsin Power & Light Company. Which is the direction of the flow of that energy? A. Energy flows in both directions through that interconnection. The interconnection was established for the purpose of providing 25,000 kilowatts of emergency service to either of the companies.

Since the establishment of this interconnection, emergency service has been taken by Wisconsin Power & Light Company

on different occasions but has not as yet been taken by Wisconsin Electric Power Company.

However, the interconnection also permits the delivery into the system of Wisconsin Electric Power Company of limited quantities of surplus hydro-electric energy from the system of Wisconsin Power & Light Company.

Such energy is generated in the hydro-electric plants of Wisconsin Power & Light Company on the Wisconsin Power river, the Kilbourn and Prairie du Sac plants being the prin- 3302
cipal hydro-electric plants operated by Wisconsin Power & Light Company.

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Some of the surplus hydro-electric energy of Wisconsin Power & Light Company is delivered into the system of Wisconsin Electric Power Company over that connection, and I should add also, in order to make the statement complete, that in every interconnection of this kind, due to fluctuations in voltage at the two ends of the interconnection, such as those that cause the interflow of power between the systems of Wisconsin Electric Power Company and Wisconsin Gas & Elec- 3303
tric Company, there is a class of energy called drift energy, which drifts back and forth from one system to the other, in either direction, fluctuating at times, depending on voltage conditions at opposite ends of the line.

That power is measured and is billed at a rate which recognizes its incidental occurrence and undependable character.

There is still another type of energy that flows through an interconnection of that kind—that is, where the switches are always closed and there are two operating systems, one at each end—that is called stabilizing energy. That is the

energy that is required to flow in a line to keep the wires charged.

In electrical terms, a high voltage transmission line serves in one respect somewhat like a large condenser, and, even though it may be delivering no energy for power purposes,

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it will still draw some current from the supply end.

That current has to be supplied in order to keep the line charged and to keep it in stable condition as one of the
3305 branches of the electric operating system.

That energy is called stabilizing energy, but it does not do any good to either company except to keep the line in operation.

Mr. Hamilton: Mr. Examiner, we have reached a good stopping place.

The Examiner: We will recess, now, until ten o'clock tomorrow morning.

(Whereupon at 4:30 p.m., the hearing was recessed until 10:00 a.m. the following morning.)

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